

Non-Motorized Digital Data Collection On State Highways Pilot Project

FINAL REPORT

Prepared For:
Humboldt County
Association of Governments

In Coordination With:
California Department of Transportation
District 1



427 'F' Street, Suite 236
Eureka, CA 95501
(707) 444-3800
Fax: (707) 444-3900

January 2011

Humboldt County
Association of Governments



HCAOG

California Department of
Transportation - District 1



NOTE: The preparation of this report was financed through transportation planning funding provided by CA Department of Transportation – District 1 and the Humboldt County Association of Governments, as the designated Regional Transportation Planning Agency.

Executive Summary

Introduction

Non-motorized transportation is a topic of increasing public interest in the Humboldt County region and statewide. However, many of the region's public and private entities lack sufficient data to support projects that encourage non-motorized activities; and current field survey methods for collecting non-motorized traffic data are expensive, time consuming, and unverifiable. Project proponents, decisions makers, and other data users are in need of new protocols and techniques to make future non-motorized traffic counts more abundant, reliable and versatile.

To address these needs, HCAOG, the Regional Transportation Planning Agency for Humboldt County, agreed to administer a contract to fund the Non-Motorized Digital Data Collection on State Highways (NMDDC) Pilot Project on behalf of Caltrans District 1. A Request for Proposal was circulated in January 2010. The contract was awarded to Manhard Consulting, a private civil engineering and consulting firm. This report is the final deliverable product of the NMDDC Pilot Project.

The primary objective of the Pilot Project was to develop an efficient and cost-effective methodology for digitally recording and counting non-motorized (i.e., pedestrian and bicycle) users of the State highway system. In addition, the RFP called for the collection of non-motorized traffic data at six (6) highway sites in District 1.

The methodology ultimately recommended in this report includes two distinct elements: the recommended data collection / camera system, as identified in Appendix B; and the suggested protocols for use of that system, as listed in Appendices C and D. For clarity and ease of presentation, the sections to follow are written in first-person, from the perspective of the project consultant, Manhard Consulting, Ltd

Phase 1 – Research and System Design

Our first phase of work was dedicated to researching, developing, and acquiring a functional digital recording system. Based on our extensive research, testing, and Pilot Project experience, we recommend the data collection system described in Appendix B.

The recommended system consists of: a camera, digital video recorder, programmable timer, and 12V battery, all assembled in a waterproof box with mounting bracket. The system is designed to be self-contained, and can be mounted to a power pole or tree by one or two people without the use of specialized tools or vehicles. Once deployed, it is capable of recording continuous digital video for several days with no maintenance required.

The system stores digital video files on high capacity SD card media. All files can be reviewed (and all traffic data can be counted) in an office setting at accelerated speeds using free, commonly available software.

Four original copies of the recommended recording system – all of which were assembled by The Security Store in Redway, CA – were delivered to Caltrans upon the issuance of this report.

Phase 2 – Sample Data Collection

Our second phase of work was dedicated to collecting digital non-motorized traffic data at six (6) highway sampling sites. The sampling sites specified in the RFP were chosen, in part, so that the recommended data collection system could be tested under a variety of site conditions: urban and rural, nearby and remote, at corridor and intersection locations, subject to light and heavy traffic, and using one or two cameras. Data were collected at the following locations:

- Intersection of Lupin Drive and HWY 255
(Manila, Humboldt County)
- Intersection of Indianola Road and HWY 101
(Indianola, Humboldt County)
- HWY 199 at Downtown Hiouchi
(Hiouchi, Del Norte County)
- Intersection of Wabash Avenue and HWY 101
(Eureka, Humboldt County)
- Intersection of East Laurel Street and HWY 1
(Fort Bragg, Mendocino County)
- Shoulder Site on HWY 1 at Pudding Creek Bridge
(Fort Bragg, Mendocino County)

Summaries of each data set are presented in Appendix F. Raw data files were delivered to Caltrans upon the issuance of this report.

Phase 3 – Data Processing and Protocol Development

Over the course of the Pilot Project, we steadily developed protocols for system installation, maintenance, and takedown, based on our ongoing experiences with the data collection system. Likewise, we developed data processing and reporting protocols in parallel with our data processing efforts.

Suggested protocols for equipment installation and operation are presented in Appendix C. While developing these protocols, we focused primarily on worker safety in the field, and proper equipment setup, given the variety of physical conditions encountered at each sampling site.

Suggested protocols for data processing and reporting are presented in Appendix D. While developing these protocols, we focused primarily on data review efficiency and quality assurance.

Comparative Cost Analysis

Upon completing our digital data collection and processing efforts at the six (6) sampling sites listed above, we calculated the costs associated with those efforts, and compared them to the estimated costs of conducting human field surveys at the same sites. Despite making conservative assumptions in favor of current field methods, we found that the recommended digital methodology was more cost effective than field methods at all six sites.

Project Findings

Based on our research and experience with the NMDDC Pilot Project, we find that digital data collection is a viable and advantageous alternative to human surveys for collecting non-motorized traffic data at highway locations. Not only do digital methods allow for greater flexibility in sampling design, they produce data that can be verified for accuracy and completeness.

The digital data collection systems and protocols recommended in this report are significantly more efficient and economical than current field survey-based methods. The greatest cost savings are realized at the following types of sites:

- Sites in rural settings;
- Sites in remote locations;
- Lightly trafficked sites;
- Simply configured sites; and
- Sites capable of being monitored with a single camera.

Although the NMDDC Pilot Project sampling sites were located within a relatively small geographic region, we believe the recommended methodology is suitable for highway locations statewide, and that data collected using this methodology may reliably be used to support all kinds of highway projects.

Table of Contents

Introduction	1
Background.....	1
Project Goals and Objectives.....	1
Contents of This Report.....	2
Phase 1 – Research and System Design	2
Output Data Requirements.....	2
Desired System Attributes	3
Alternatives Considered.....	4
Prototype Testing	4
Prototype Modifications.....	5
Battery Systems	5
SD Memory Cards.....	5
Vandalism Concerns.....	5
Recommended Data Collection System	6
Phase 2 – Sample Data Collection	6
Sampling Site Characteristics	6
Sampling Locations and Dates	7
Design Sampling Intervals.....	8
Encroachment Permit Requirements	8
Phase 3 – Data Processing and Protocol Development.....	9
Suggested Data Collection / Equipment Operation Protocols.....	9
Worker Safety	9
Proper Equipment Setup	9
Suggested Data Processing / Reporting Protocols	10
Data Review Efficiency	10
Quality Assurance	10
Comparative Cost Analysis	11
Digital Data Collection Costs and Assumptions.....	11
Human Survey Costs and Assumptions.....	12
Differences in Data Review Time.....	12
Third Party Estimates.....	13
Project Findings.....	13
Suggestions for Further Research and Methodology Improvements	14

List of Tables

Table 1. Cost Comparison of Digital Data Collection vs. Human Survey Methods.

Table 2. Comparison of Review and Reporting Time for Digital Data Collection vs. Human Survey Methods.

List of Appendices

Appendix A: List of Contributors

Appendix B: Recommended Data Collection System

Appendix C: Suggested Protocols for Equipment Installation and Operation

Appendix D: Suggested Protocols for Data Processing and Reporting

Appendix E: Excerpts from Digital Video Recorder (DVR) User's Manual

Appendix F: Traffic Data Summaries

Appendix G: Encroachment Permit No. 0110-N-MC-0298

Introduction

This report is the final deliverable product for the Non-Motorized Digital Data Collection on State Highways (NMDDC) Pilot Project, administered by the Humboldt County Association of Governments (HCAOG), on behalf of the California Department of Transportation (Caltrans) District 1, via contract with Manhard Consulting, Ltd. (formerly White Engineering), a private civil engineering and consulting firm.

Background

Non-motorized transportation is a topic of increasing public interest in the Humboldt County region, as well as throughout the District and the State. Many of the region's public and private entities support the development of projects that encourage non-motorized activities. However, those entities often lack sufficient data to support projects and programs that could lead to improved conditions for the cycling and walking public.

At present, non-motorized traffic data are generated through field surveys in which personnel are required to stand at precise highway locations and manually count and record pedestrians and cyclists for many hours over the course of several days. This methodology is expensive, time-consuming, and not verifiable. Project proponents, decisions makers, and other data users are in need of new protocols and techniques to make future non-motorized traffic surveys more abundant, reliable and versatile.

To address these data needs, HCAOG, the Regional Transportation Planning Agency for Humboldt County, agreed to administer a contract on Caltrans' behalf. The purpose of the contract was to instigate a pilot project for the development of a new methodology for the collection of non-motorized traffic data within the State highway system. The new methodology, if proven effective, may be used to conduct future non-motorized traffic counts for the development of Corridor System Management Plans (CSMP), Transportation Concept Reports (TCRs), and other similar products.

The Request for Proposal (RFP) for the NMDDC Pilot Project was circulated in January 2010. The contract for the project was awarded to White Engineering (now Manhard Consulting, Ltd.), in May 2010, and the project is complete as of the issuance of this report.

Project Goals and Objectives

As stated in the RFP, the primary objective of the NMDDC Pilot Project is to develop an efficient and cost-effective methodology for digitally recording and counting non-motorized (i.e., pedestrian and bicycle) users of the State highway system.

Specifically, the new methodology must not only be capable of counting and recording pedestrians and cyclists using State highways, but must also be capable of discerning the differences between commuters and touring cyclists, and whether or not cyclists are using safety equipment. Data collected under this methodology will be used to help determine the specific needs of the non-motorized public based on these attributes.

Another objective of the Pilot Project is to produce up-to-date, non-motorized traffic data for six (6) specific highway sites in District 1. This effort is valuable for two reasons. First, as stand-

alone products, the data sets collected are immediately useful to District 1 planning staff. Second, the *act* of production within the larger context of the Pilot Project allows for a comparative cost analysis of the newly developed data collection methodology (using cameras mounted on light poles) versus the existing methodology (using human surveyors in the field).

Contents of This Report

This report and its appendices contain summaries of all NMDDC Pilot Project activities, findings, and data products, including:

- Summary of Phase 1 research and system development efforts;
- Summary of Phase 2 data collection efforts at six sampling sites;
- Summary of Phase 3 data processing and protocol development efforts;
- Description of the recommended digital data collection system, including all components and accessories (Appendix B);
- Suggested protocols for equipment installation and operation (Appendix C);
- Suggested protocols for data processing and reporting (Appendix D);
- Comparative cost analysis of the recommended data collection methodology versus previously available methods;
- Project findings; and
- Suggestions for further research and system / protocol improvement.

This report is accompanied by digital spreadsheet (MS Excel) files containing traffic count data for the six monitoring locations specified in the RFP. Summaries of these digital files are presented in Appendix E.

The methodology ultimately recommended in this report includes two distinct elements: the recommended data collection / camera system, as identified in Appendix B; and the suggested protocols for use of that system, as listed in Appendices C and D. For clarity and ease of presentation, the sections to follow are written in first-person, from the perspective of the project consultant, Manhard Consulting, Ltd.

Phase 1 – Research and System Design

We began developing the new data collection methodology under the presumption that the final product would be some form of a mechanized, remote, digital recording system used in conjunction with some form of an accelerated office-based data review protocol. Thus, our first phase of work was dedicated to researching, developing, and acquiring a functional digital recording system.

Output Data Requirements

As specified in the RFP, the digital recording system must allow for the collection and processing of data with the following output characteristics:

- Count data should be in Excel format and should include (at a minimum) consecutive 15-minute count periods totaling 13 hours per day (for example, 6am to 7pm) for three 3 consecutive days;
- Data fields should include all turning, through- and cross-movements for pedestrians and bicycles noted independently;
- Bicycles counted should be noted for safety gear (helmet or not) and for appearance (commuter or tourist).

Desired System Attributes

Based on early discussions between our staff, Smith Electric Construction (a sub-consultant), and Caltrans planning, maintenance, electrical, and encroachment permit staff, we established the following list of desired system attributes. While no one system can possess all of these attributes (some of them are mutually exclusive), the list serves as a standard against which potential options may be evaluated and compared.

The data collection system must/should have the following attributes (in no particular order):

- Must be affordable (i.e., less than \$2,000 per unit);
- Must be durable (i.e., capable of being repeatedly installed, removed, and/or vandalized with low risk of equipment damage or data loss);
- Must be weather resistant (i.e., all system components or the system container rated IP 66 or higher);
- Should be low-profile (i.e., inconspicuous to vandals) when mounted on a pole;
- Equipment should be available from a reliable manufacturer, based on technology that won't be obsolete or unavailable in the short-term;
- Must be independently powered, with an on-board power supply capable of lasting for a single deployment (i.e., at least three days with 13 hours of recording time per day);
- Need not be capable of recording at night;
- Should include a timer or sleep mode for off-hours;
- Should collect streaming video data, as opposed to still frames triggered by a timer or motion sensor;
- Should be capable of recording at different speeds (i.e. at variable frames per second);
- Must be capable of low-resolution recording, either via a resolution setting or manual focus;
- Should have a high visual range (i.e., approximately 75 feet) and broad viewing angle (i.e., approximately 100 degrees), or should allow for the use of different lenses for varying site conditions;
- Must be capable of storing enough data for a single deployment (i.e., at least 39 total hours of recorded video);
- Should store all data on removable media, such as a memory card or USB drive, which can be retrieved while the system is in a mounted position;

- Must be easy to assemble, to set up in the field, and to take down without the use of specialized tools, equipment, or vehicles;
- Should be relatively small in size and lightweight (i.e., capable of being safely mounted on a light post or tree by one individual on a ladder);
- Must be capable of being aimed, zoomed, and/or focused, once installed;
- Should allow for recorded images to be viewed in real-time during installation, without requiring the installer to come down the ladder;
- Video data must be easily reviewable in an office setting and converted into spreadsheet form according to Caltrans specifications;
- Video data should be reviewable in ‘fast motion’ using free, commonly available software;
- Video data must be time-stamped for data processing purposes.

Alternatives Considered

Our research of available camera system technology included extensive online research, visits to local electrical, camera and security stores, telephone and email communications with distant and local vendors, and consultations with experts in surveillance, electronics, and digital photography.

Based on the above list of desired system attributes, we initially ruled out several retail off-the-shelf home surveillance systems, as well as several high-end commercial systems. In general, we found most off-the-shelf systems (available from retail outlets such as Costco, Sears, and Radio Shack) to be poorly constructed, inflexible, and not likely to be available in the long-term. In contrast, most commercial systems offered by electrical specialists were relatively heavy, expensive, and better suited for permanent camera installations.

Superior options for data collection systems were available from an online vendor (Advance Security Products in Belleville, IL <http://www.surveillance-spy-cameras.com/>) and a local surveillance expert (The Security Store in Redway, CA). Each was willing to custom-build systems using components capable of meeting our specified needs. In each case, the components included: a carrying case, mounting hardware, low-profile camera, digital video recorder w/ SD card media, battery, and miscellaneous wire connections.

Prototype Testing

The first two prototypes of the data collection system were ultimately built by The Security Store using some components purchased from Advance Security Products. The only difference between the first two prototype systems was the camera. One system featured a color camera with a built-in vari-focal lens. The other system featured a black-and-white camera with manually interchangeable lenses.

Upon our receipt of the prototype systems, we began a course of extensive bench- and field-testing to familiarize ourselves with the equipment and its operation. Bench tests were conducted in an office setting, focusing primarily on system behavior, data card capacity and battery life. Field tests were conducted in the Caltrans Bracut Maintenance Yard, focusing primarily on camera performance, image quality based on DVR settings, and installation / takedown techniques.

Prototype Modifications

Prototype testing revealed the need for certain system modifications prior to proceeding with data collection for the Pilot Project. Specifically, we encountered problems related to short battery life, memory card failures, and potential for vandalism. Modifications made to address these problems are briefly described below.

Battery Systems

Initial testing revealed two notable battery issues. First, we found that the camera and DVR each continued to draw significant battery power even when the DVR was not actively recording (as controlled by the DVR timer). Our original design calculations for battery size assumed virtually no draw when the DVR was deactivated. As a result, the prototype system battery was significantly undersized.

Second, assuming the first battery issue could be remedied, the total battery life for the system allowed for too little surplus beyond the desired 39-hour monitoring interval for a single deployment. In order to allow for greater flexibility in deployment scheduling, additional battery life would be necessary.

To remedy these issues, a new timer / switch was added to the system capable of cutting power to both the camera and the DVR when not actively recording. Secondly, the battery size was increased from 12 Amp-hours to 20 Amp-hours. These modifications combined to provide the data collection system with greater total battery life.

SD Memory Cards

Memory card failures were a recurring problem during initial system testing. In general, we observed that the likelihood of card failure increased as card capacity and image resolution increased. Furthermore, we observed that any card failure caused all recording activities to stop until the DVR could be reprogrammed, thus causing a substantial loss of data.

To remedy this critical system shortcoming, we replaced all standard SD cards (Class 2 or 4) with high-speed SD cards (Class 6 or better). Following this change, memory card failures ceased to occur, regardless of card capacity and image resolution.

Vandalism Concerns

The first prototype systems were designed assuming the camera would be positioned on the underside of the carrying case when mounted to a pole. Due to safety constraints, systems installed by a single person on a ladder can be mounted no higher than approximately 10-12 feet above the ground. Therefore, not only did this configuration increase the chances of the system being noticed and recognized by passers-by, it put the camera within easy reach of damage by vandals.

To remedy this issue, we reconfigured the system by moving the camera to the topside of the carrying case, thus making it less noticeable, and less susceptible to vandalism.

Recommended Data Collection System

Based on our extensive research, testing, and experience under the NMDDC Pilot Project, we recommend the data collection system described in Appendix B.

Four copies of the recommended system (two with color cameras, and two with black-and-white cameras) accompany this report and shall be delivered (with accessories) to Caltrans upon its issuance. All systems were assembled by The Security Store in Redway, CA. Replacement parts, additional copies, and other accessories are available through the same, or through alternate sources as listed in Appendix B.

Phase 2 – Sample Data Collection

Our second phase of work under the NMDDC Pilot Project was dedicated to collecting digital non-motorized traffic data at six highway sampling sites, as specified in the RFP, and as slightly modified by Caltrans during the Pilot Project.

We collected initial data at ‘nearby’ sampling sites using the first system prototypes, which were set to record at low resolution, and which required multiple battery switches over the course of three (3) sampling days. We collected subsequent data at ‘remote’ sampling sites using the modified prototype systems (i.e., the data collection systems ultimately recommended in this report), set to record at medium resolution.

Activities conducted during this phase of work served as the basis for protocol development during Phase 3 of the Pilot Project, which is described later in this report.

Sampling Site Characteristics

The sampling sites specified in the RFP were chosen, in part, so that the recommended data collection system could be tested under a variety of site conditions. Site characteristics that vary between sites include:

Setting:

Urban, Rural

Proximity to District 1 Office:

Nearby (< 30 miles), Mid-range (30 - 90 miles), Remote (> 90 miles)

Non-Motorized Traffic Volume:

Light (< 100 events / day), Moderate (100 - 200 events / day),
Heavy (> 200 events / day)

Site Configuration:

Intersection, Corridor

Number of Cameras Required:

One (1), Two (2)

Sampling Locations and Dates

Digital non-motorized traffic data were recorded at the following sampling locations during the dates indicated. Complete digital video files and processed spreadsheet data accompany this report and shall be delivered to Caltrans upon its issuance.

Intersection of Lupin Drive and HWY 255 (Manila, Humboldt County)

Site Name: Manila
Record Dates: 8/13/10 - 8/16/10

Setting: Rural
Proximity: Nearby (6 miles)
Traffic Volume: Light
Configuration: 4-way intersection
of Cameras: One (1)

Intersection of Indianola Road and HWY 101 (Indianola, Humboldt County)

Site Name: Indianola
Record Dates: 8/13/10 - 8/16/10

Setting: Urban
Proximity: Nearby (5 miles)
Traffic Volume: Light
Configuration: 3-way intersection, divided highway
of Cameras: One (1)

HWY 199 at Downtown Hiouchi (Hiouchi, Del Norte County)

Site Name: Hiouchi
Record Dates: 8/17/10 - 8/20/10

Setting: Rural
Proximity: Remote (93 miles)
Traffic Volume: Moderate
Configuration: Corridor
of Cameras: One (1)

Intersection of Wabash Avenue and HWY 101 (Eureka, Humboldt County)

Site Name: Wabash
Record Dates: 8/24/10 – 8/27/10

Setting: Urban
Proximity: Nearby (1 mile)
Traffic Volume: Heavy
Configuration: 5-way intersection
of Cameras: Two (2)

Intersection of East Laurel Street and HWY 1
(Fort Bragg, Mendocino County)

Site Name: Downtown Fort Bragg
Record Dates: 8/30/10 - 9/3/10

Setting: Urban
Proximity: Remote (133 miles)
Traffic Volume: Heavy
Configuration: 4-way intersection
#of Cameras Two (2)

Shoulder Site on HWY 1 at Pudding Creek Bridge
(Fort Bragg, Mendocino County)

Site Name: Pudding Creek
Record Dates: 8/30/10 - 9/3/10

Setting: Rural
Proximity: Remote (132 miles)
Traffic Volume: Light
Configuration: Corridor
of Cameras: One (1)

Design Sampling Intervals

As specified in the RFP, the design interval for counting non-motorized traffic at any site is three (3) consecutive 13-hour ‘days.’ However, based on guidance received from Caltrans during the Pilot Project, it is acceptable to straddle evenings on either side of a sampled interval.

At most sampling sites, we collected more than 39 total hours of video data, but we only processed and reported data for the required (3) consecutive 13-hour ‘days.’ Data summaries for each sampling site, including the total number of hours recorded, as well as the designated ‘design day’ for each site (based on the most ideal lighting conditions), are presented in Appendix F.

Encroachment Permit Requirements

Before mounting data collection equipment to Caltrans light poles at the locations specified above, we first applied for and received an encroachment permit from District 1 to conduct the work (Permit No. 0110-N-MC-0298, presented in Appendix G). The permit contained notification, inspection, and traffic control requirements to be followed during all roadside activities. Future users of the data collection system recommended in this report will be responsible for knowing and adhering to similar applicable requirements for such work.

Since all of our sampling work was conducted at off-shoulder highway locations, or on sidewalks, the encroachment permit required no more than a typical shoulder closure at any single location. Furthermore, most equipment installation, maintenance, and takedown activities took less than thirty minutes to complete, and required no more than two (2) people.

Phase 3 – Data Processing and Protocol Development

Over the course of the Pilot Project, we steadily developed protocols for system installation, maintenance, and takedown, based on our ongoing experiences with the data collection system. Likewise, we developed data processing and reporting protocols in parallel with our data processing efforts. This section briefly describes some of the choices we made while developing these protocols.

Suggested Data Collection / Equipment Operation Protocols

Suggested protocols for equipment installation and operation are presented in Appendix C. While developing these protocols, we focused primarily on worker safety in the field, and proper equipment setup, given the variety of physical conditions encountered at each sampling site.

Worker Safety

Given that the recommended data collection system was designed to be mounted to light posts (or trees) at highway shoulder locations, we spent considerable time searching for and experimenting with protocols and equipment that would maximize worker safety. Our goal, based on the desired system attributes previously listed in this report, was to identify protocols and techniques allowing for the system to be safely installed in the field by a single worker without the use of specialized equipment or vehicles.

Based on our research and experience, we found that a common orchard ladder is the safest means of accessing elevated mounting positions, due to its wide stance and adaptability to the uneven grades often encountered at highway shoulder locations. While on the ladder, a worker should always have one hand free to hold his/her position. Therefore, we recommend the use of a tool belt to hold all tools and accessories, a neck-strap to carry the handheld video monitor, and a mounting strap system capable of being secured using a handheld cordless screwdriver.

Proper Equipment Setup

Upon reviewing our first field-collected data sets, we concluded that proper equipment setup, given the physical conditions at the intended sampling site, is critical to the successful use of the recommended data collection system. Our first few data sets suffered in some instances from low resolution, less-than-ideal lighting conditions, and pedestrians appearing too distant or too close for efficient data review. Furthermore, at sites where two cameras were used, data processing and recording activities were made difficult by the inconvenient overlap of camera views. While none of these difficulties rendered any particular data set unusable, they did tend to increase the number of person-hours required to effectively process and record non-motorized traffic data.

To remedy the difficulties described above, we found it necessary to use higher resolution recording settings, to account for the position of the sun over the course of a day when selecting a mounting position, and to choose camera lenses that maximize the amount of time any cyclist or pedestrian remains within the recorded view of the camera.

Suggested Data Processing / Reporting Protocols

Suggested protocols for data processing and reporting are presented in Appendix D. While developing these protocols, we focused primarily on data review efficiency and quality assurance.

Data Review Efficiency

The biggest factors affecting the efficiency of data review are: (1) the choice of data review software, and (2) a reviewer's familiarity with the software's features. Our goal, based on the desired system attributes previously listed in this report, was to identify a free, commonly available software platform capable of facilitating the efficient review of many consecutive hours of video data.

Based on our research, the most viable software options for reviewing digital traffic data are Video LAN Client and Windows Media Player. While each platform offers unique advantages relative to the other, we found Windows Media Player to be superior for our needs. Ultimately, all data for the NMDDC Pilot Project were processed using Windows Media Player (v.11).

Over the course of our data processing efforts, we came to recognize the value of time spent researching and becoming closely familiar with the features offered by the data review software. To maximize efficiency, we suggest that data reviewers familiarize themselves well with the file management structure, advanced plug-in features, and shortcut functions available for Windows Media Player (v.11).

Quality Assurance

Given the importance of non-motorized traffic counts to Caltrans' planning and program development efforts, processed digital traffic data must be demonstrably complete and verifiable. To address these needs, we suggest creating separate roles for data managers and data reviewers, and incorporating the following quality assurance measures into the data processing routine:

- To Promote Data Completeness:

Prior to the review of a data set, a manager should check and report on the completeness of all video files, and should specify an appropriate 'design day' for that set. If the manager determines that the set is not sufficiently complete, it should not be reviewed.

- To Promote Data Consistency:

Blank data entry sheets for each data set should be prepared by a manager, and then given to a reviewer for data processing. The reviewer should populate those sheets with processed data, and return them (once complete) to the data manager for review and/or correction prior to final acceptance.

- To Promote Data Accuracy:

Two hours of data from each data set should initially be reviewed and processed in parallel by a manager and a reviewer. The two should compare and discuss their results to address any discrepancies, and to make any needed adjustments to the data entry sheets or reviewing protocols. Once such adjustments are made, the manager should decide whether a second review-in-parallel is necessary, prior to allowing the reviewer to process the rest of the data.

Comparative Cost Analysis

As previously stated, the primary objective of the NMDDC Pilot Project is to develop an *efficient* and *cost-effective* methodology for digitally recording and counting non-motorized users of the State highway system. This section contains cost estimates and supporting information intended to demonstrate the cost differences between the digital data collection methodology recommended in this report, and the human survey methodology currently used throughout the State.

Table 1 contains cost estimates for non-motorized traffic monitoring activities at the six sites specified in the RFP. For comparative purposes, the ‘costs’ itemized below are presented in terms of either person-hours or dollars. Data listed in the table for digital methods are estimates based on actual expenditures incurred during the NMDDC Pilot Project. Data listed for human survey methods are estimates based on our understanding of those methods.

Table 1. Cost Comparison of Digital Data Collection vs. Human Survey Methods.

	NMDDC Methods		Human Survey Methods	
Sampling Site	Person-Hours	Other Costs*	Person-Hours	Other Costs*
Manila	29.5		52.5	
Indianola	39		52.5	
Pudding Creek	39.5	\$264	56	\$527
Hiouchi	42.5	\$186	54.5	\$488
Wabash	50.5		99	
Downtown Fort Bragg	67.5	\$266	106	\$923

* Other Costs include: mileage (\$0.50 per mile), lodging (\$85 per night), and meals & incidentals (\$40 per diem) for monitoring staff.

Digital Data Collection Costs and Assumptions

Person-hours reported in Table 1 for digital data collection methods include hours spent during the following activities: site reconnaissance, field preparation, travel (assumes two round trips per site), camera system installation, camera system takedown, data sheet set-up, data completeness checks, digital data review and processing (as listed in Table 2), data entry, and data verification.

Other costs reported in Table 1 for digital methods are limited to mileage costs for traveling staff, as these methods do not require personnel to stay overnight in remote locations. However, initial equipment purchases of approximately \$1,800 per camera system are not reported.

We believe that the costs listed in Table 1 for digital data collection at the six Pilot Project sites are representative of the costs that may be expected for future monitoring efforts at similar sites. Furthermore, as monitoring staff gain experience using the recommended camera system and data processing protocols, we believe that the number of hours required to collect and record non-motorized traffic data will decrease.

Human Survey Costs and Assumptions

Person-hours reported in Table 1 for human survey methods include hours spent during the following activities: site reconnaissance, field preparation, travel (assumes one round trip per remote site, and three round trips per nearby site), data sheet set-up, field surveying and data processing (as listed in Table 2), data entry, and data verification.

Other costs reported in Table 1 for human survey methods include costs associated with mileage, 3 nights lodging, and 3.5 days of meals and incidentals for each traveling surveyor.

For purposes of estimating the costs associated with human survey methods, we assumed a *single person* would conduct each traffic survey, except at the Wabash and Downtown Fort Bragg sites, where *two persons* would be needed to collect a complete data set (due to complex site configurations and high non-motorized traffic volumes). Given these assumptions, we believe our estimates for human survey methods may be deceptively low, because they do not account for potential, significant cost increases due to agency rules regarding overtime and worker safety.

Differences in Data Review Time

The most significant line-item cost difference between the digital data collection and human survey methodologies is due to data review and reporting time. When human surveyors are used, they must occupy the sampling site for all 39 hours of the sampling interval. When mechanized camera systems are used, review time is limited to time spent in an office setting watching recorded video at rates as fast as 8 times normal speed.

Table 2 lists the number of hours we spent during the NMDDC Pilot Project viewing and processing recorded video for each sampling site, as compared to the *minimum* number of hours required to conduct and process a real-time field survey. For the Wabash and Downtown Fort Bragg sites, where two cameras were used, the number of hours we spent reviewing recorded video necessarily doubled.

Table 2. Comparison of Review and Reporting Time for Digital Data Collection vs. Human Survey Methods.

	NMDDC Method	Human Survey Methods
Sampling Site	Person-Hours	Person-Hours
Manila	14	39
Indianola	23.5	39
Pudding Creek	15	39
Hiouchi	21	39
Wabash	34	78*
Downtown Fort Bragg	42	78*

* Assumes two surveyors per site.

Third Party Estimates

As an additional means of cost comparison, we solicited and received estimates from three private firms for non-motorized traffic monitoring at the six sampling sites specified in the RFP. The estimates we received are as follows:

<u>Vendor</u>	<u>Address</u>	<u>Estimate</u>
Traffic Data Service (assumes two surveyors at Wabash site only)	Campbell, CA	\$14,650
Murthy Transportation Consultants, Inc. (assumes two surveyors at Wabash site only)	Fullerton, CA	\$20,475
TPG Consulting, Inc. (assumes one surveyor per site)	Visalia, CA	\$15,575

All estimates assume additional, unanticipated, and/or some travel costs will be charged at standard rates. A direct comparison of these estimates and the costs listed in Table 1 may be made by assigning hourly rates to the person-hours listed – an exercise left to the reader.

Project Findings

Based on our research and experience with the NMDDC Pilot Project, and based on the cost comparison information provided above, we find that digital data collection is a viable and advantageous alternative to human surveys for collecting non-motorized traffic data at highway locations. Not only do digital methods allow for greater flexibility in sampling design, they produce data that can be verified for accuracy and completeness.

The digital data collection systems and protocols recommended in this report are significantly more efficient and economical than current field survey-based methods. The greatest cost savings are realized at the following types of sites:

- Sites in rural settings;
- Sites in remote locations;
- Lightly trafficked sites;
- Simply configured sites; and
- Sites capable of being monitored with a single camera system.

Although the NMDDC Pilot Project sampling sites were located within a relatively small geographic region, we believe the recommended methodology is suitable for highway locations statewide, and that data collected using this methodology may reliably be used to support all kinds highway projects.

Suggestions for Further Research and Methodology Improvements

Based on our experience with the recommended data collection system and associated protocols, we offer the following suggestions for further research and methodology improvement:

- Design a protective shroud to be added to the data collection system to protect the camera from weather and light exposure, to decrease overall conspicuousness, and to reduce the risk of damage from vandalism.
- Conduct comprehensive bench testing on the recommended data collection system to determine maximum battery and memory capacities versus resolution, speed, and image size. Such information may be used to optimize sampling designs and overall system performance.
- Conduct further research of alternative viewers for video files, including proprietary software (i.e., software that is not available free-of-charge). Specifically, consider viewers capable of displaying video files in separate windows (preferably synchronized) for sites where two or more cameras are required.
- Revise / Improve the suggested protocols presented in Appendices C and D to better reflect agency requirements for field safety, quality assurance / quality control, and other relevant policies; and reissue the protocols in a standardized NMDDC User's Manual, to be maintained and periodically revised by dedicated Caltrans staff.
- Revise / Improve templates used for data presentation, such as those presented in Appendix E and in the raw data accompanying this report, based on agency needs and public preferences. For instance, site schematics, maps, and/or photographs could be added to current templates to improve the level of information conveyed to data end users. Standardize and reissue the templates for Caltrans use across the District and/or State.

Appendix A: List of Contributors

List of Contributors

The following individuals were responsible for the completion and success of the NMDDC Pilot Project:

Caltrans - District 1

System & Community Planning
1656 Union Street
Eureka, CA 95501
707.445.6600

Rex Jackman
System & Community Planning Chief

Rick Mayberry, P.E.
Transportation Engineer

Alyson Hunter
Associate Transportation Planner

Humboldt County Assoc. of Governments

427 F Street, Suite #220
Eureka, CA 95501
707.444.8208

Marcella Clem
Executive Director

Manhard Consulting, Ltd.

(formerly White Engineering)
427 F Street, Suite #236
Eureka, CA 95501
707.444.3800

Praj White, P.E.
Area Manager

David Kuszmar, P.E.
Project Manager

Tim Windbigler
Engineering Technician

Smith Electric Construction

875 Eureka Street
Eureka, CA 95503
707.443.5818

Harold Smith
Licensed Contractor

Additional contributors to whom we are grateful include staff from the following business and organizations:

- The Security Store (Redway, CA)
- Advance Security Products (Belleville, IL)
- Swanlund's Camera (Eureka, CA)
- Redwood Electronics Corporation (Eureka, CA)
- Manhard Consulting (Eureka, CA)
- Caltrans District 1 Encroachment Permits, Maintenance, Traffic Operations, Traffic Safety, System Planning, and Community Planning Units (Eureka, CA)

Appendix B: Recommended Data Collection System

Recommended Data Collection System

System Components

Carrying Case

Make: Pelican Brand

Model: 1400 silver color

Specs: 13.37"x 11.62" x 6.00", comes w/ Pick N' Pluck™ foam in the case and convoluted foam in the lid. Threaded, compression grommets of unknown make and model necessary for sealing wire runs from exterior conditions provided and installed by The Security Store (TSS). Velcro spots or tape applied to the case to hold foam and miscellaneous loose components made by 3M. Everfocus model EPTZ – PLMN stainless steel pole mount bracket and bracket-to-case mounting hardware w/ weather resistant provided and installed by TSS.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendors:

Case - Engineered Packaging Solutions www.pelcancasesnow.com 800.592.7406

Velcro - ULINE www.uline.com 800.958.5463

Cameras

Make: Advanced Security Products (proprietary)

Model: SSC-113WEX

Specs: Black and white, weather proof, 1/3" Sony EX view super HAD CCD, 580 horizontal TV lines. 2:1 interlace scanning, electronic shutter 1/60 – 1/100,000(sec), 0.0003 lux / F2.0 sensitivity, S/N ratio more than 50dB, 150 mA / DC 12V power input. Various lenses available: 3.6mm, 6mm, 8mm, 12mm, 16mm.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

Advanced Security Products www.surveillance-spy-cameras.com 866.720.0779

Make: Everfocus

Model: EZ-VF325NH

Specs: Color, IP67 rated, 1/3" Sony EX view super HAD color CCD, 550 TV lines. 2:1 interlace scanning, electronic shutter 1/60 – 1/100,000(sec), 1.0 lux / F2.0 sensitivity, S/N ratio more than 45dB, 130 mA / DC 12V power input. Vari-focal lens 4mm to 9mm.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

123 Security Products www.123securityproducts.com 866.440.2288

Battery

Make: Enersys

Model: Data Safe NPX-80B

Specs: 7.13" x 2.99" x 6.57" Lead Acid 12V, 80W per cell, 20Ah, 250 cycles at 100% discharge, 14.5lbs.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

Portable Power Systems www.gotbatteries.com 800.551.5645

Manual Timer

Make: GTO

Model: TM 619

Specs: 24 hour / 7 day, 12V DC, 16A contact rating, up to 8 on/off per day, CR2032 lithium battery back-up. Wire harness provided and installed by TSS.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

Timerco www.timerco.com 888.874.6280

Digital Video Recorder (DVR) w/ Remote Control

Make: Advanced Security Products (proprietary)

Model: SSC-758

Specs: Long-term outdoor, solid state (SD card memory), record continuously or via motion detection, 1-hour increment schedule options, 140mA / 12V DC power, programmable, 1-30fps frame rate, 320 x 240 or 640 x 480 resolution. AC adapter included, input 100 – 240V 0.15Amax 50-60Hz, output 12V DC 0.5A.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

Advanced Security Products www.surveillance-spy-cameras.com 1.866.720.0779

Memory Card

Make: (Various)

Model: Secure Digital (SD)

Specs: High capacity (SDHC), Class 6 or better, 8GB minimum recommended.

Local Sources:

The Security Store (Redway California) 707.923.2363

Swanlunds Photography www.swanlunds.com 707.442.4522

Online Vendor:

1One Call www.onecall.com 866.340.9991

Accessories

Handheld Video Monitor

Make: Arm Electronics

Model: 35SMKIT

Specs: 5.91" x 3.35" x 2.87" total size, 3.5"(diag) Color LCD, 480 x 234 resolution, R.G.B Delta picture, (8) No.3 Alkaline batteries power source, BNC connector, 200g.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

B&H Photo www.bhphotovideo.com 800.606.6969

Battery Charger

Make: Vector

Model: VEC080

Specs: UL listed. Input: 120 volts AC, 60 Hz, 0.5 Amps. Output: 12 volts DC, 2/1 Amps. Includes DC accessory plug, batter harness clips, and battery ring terminal harness. Features red, yellow, and green LED indicator lights, automatic power on/off, and built-in circuit protection.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

Sears: www.sears.com

Combo Lock

Make: Master Lock

Model: 643D

Specs: 1-9/16" solid metal body, nickel-plated steel shackle, 4-entry resettable combination.

Local Sources:

Target, ACE Hardware, Do-It-Best Hardware, Walgreens

Online Vendors:

See: http://www.masterlock.com/where_to_buy/

USB SD card reader

Make: Kawau

Model: SDHC C227

Specs: High-speed 8-in-1 USB 2.0 card reader / writer for SD MMC, compatible with Windows 98 / 2000 / XP / Vista and Mac OS 8.61.

Local Source:

The Security Store (Redway California) 707.923.2363

Online Vendor:

Sourcing Gate www.sourcinggate.com

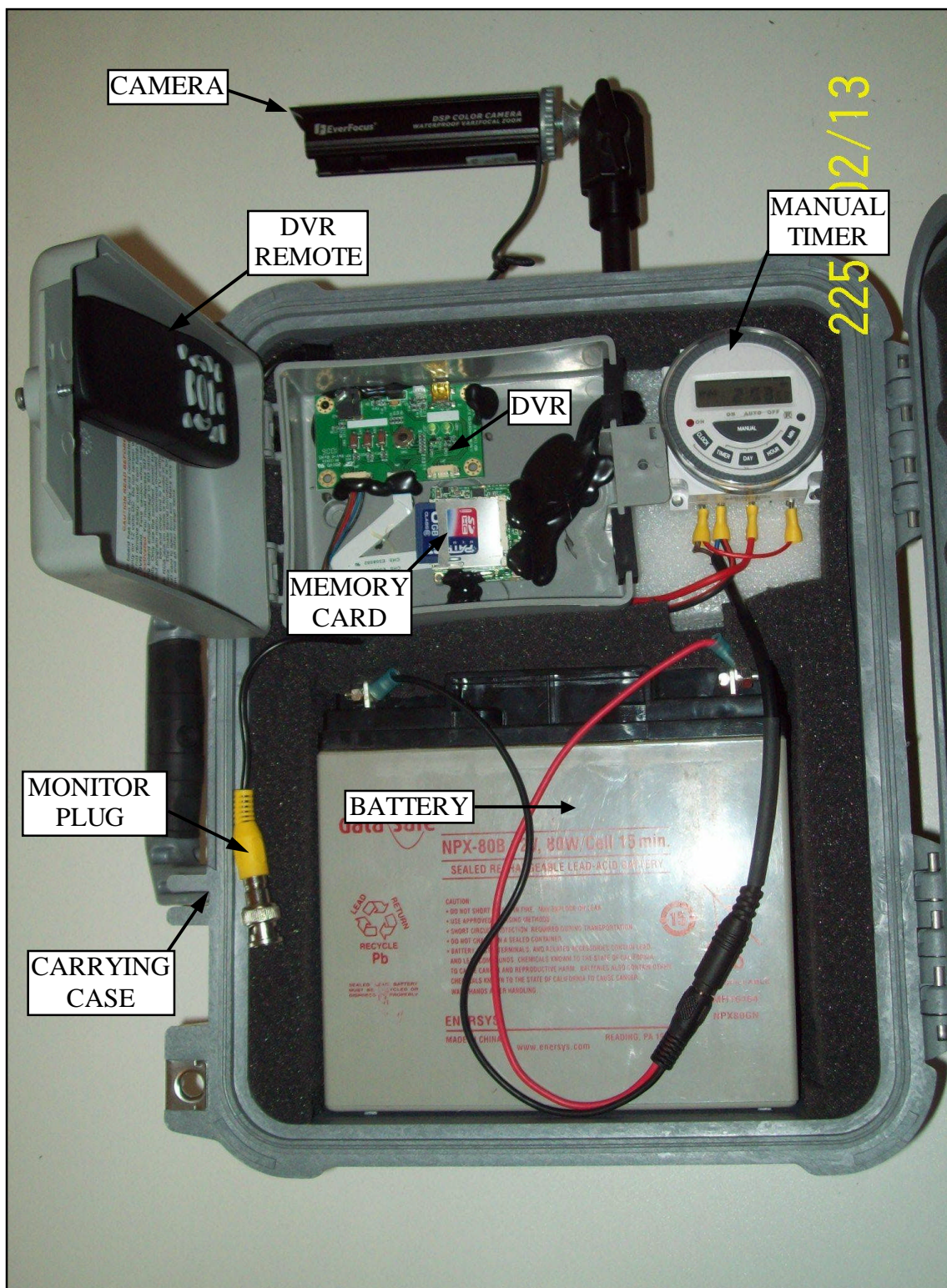


Figure 1. Recommended Digital Data Collection System.

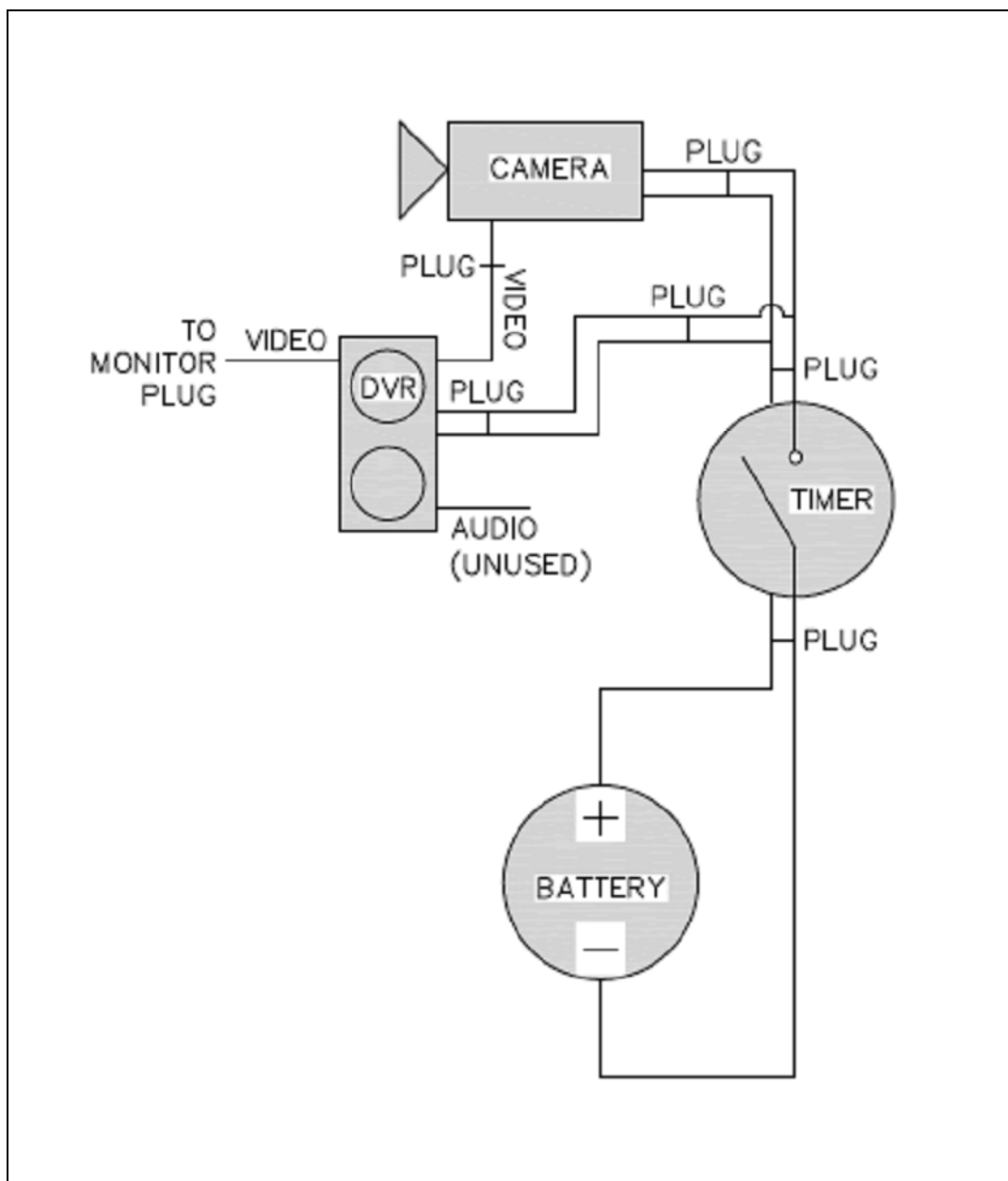


Figure 2. Digital Data Collection System Wiring Schematic

Appendix C: Suggested Protocols for Equipment Installation and Operation

Suggested Protocols for Equipment Installation and Operation

Equipment Installation Procedures

Before Leaving for the Field:

- (1) Recon your site and carefully plan your equipment installation activities. Visit the site in person, or view it using the Caltrans Photolog or your favorite mapping and/or satellite imaging software.
 - When planning your field schedule, determine the best time for equipment installation (and removal), considering lighting conditions, local traffic patterns, and safety concerns. For instance, it may be advantageous to schedule equipment installation for the time of day you suspect lighting conditions to be the least favorable for filming, so that you may observe and address any lighting-related problems upon installation. It may also be advantageous to schedule equipment installation to avoid suspected periods of heavy motorized traffic, or to target suspected periods of heavy pedestrian traffic.
 - When identifying potential mounting location(s) for monitoring unit(s), work with the Data Manager to take inventory of all the pedestrian and cycling movements you may wish to capture on video at your sampling site. Determine the number of monitoring units you'll need to install in order to capture all anticipated movements. Identify candidate mounting locations, and devise a plan with your field partner (if applicable) for safe parking, transit, and equipment installation at each candidate location. Determine which type of camera (B&W or color) may be best suited for each candidate location, and which lenses or vari-focal settings you intend to use.
- (2) Review the DVR User's Manual (Appendix E). Familiarize yourself with its many functions, and how to access those functions using the handheld video monitor and DVR remote control.
- (3) Gather all the items listed in the Field Preparation Checklist (below), and pack them for easy access in the field. Be sure that all devices with rechargeable batteries are fully charged, and that replacement disposable batteries are available for all other devices.
- (4) Pre-program the DVR and manual timer with your preferred settings (resolution, video image size, file size, frames per second, recording interval, etc.) using the handheld video monitor and the DVR remote control. Synchronize the DVR and manual timer to the correct date and time. To avoid potential data loss, always set the manual timer to turn on and off at least 15 minutes before and after the DVR does so, respectively.
- (5) Conduct a bench test of the monitoring unit to be sure all components (i.e., timer, DVR, SD card, camera, digital monitor, mounting hardware, and combo lock) are in proper working order.

Once in the Field

- (1) Be safe at all times! Park your vehicle out of harm's way; set up cones and/or safety signs as required by your encroachment permit, agency rules, or as site conditions warrant; and wear appropriate safety attire for all field activities.

- (2) Choose your intended mounting location, and situate the ladder so that the monitoring unit may be safely mounted without excessive reaching, straining, or leaning. For safe ladder placement and use, follow these additional tips:
 - Whenever possible, situate the ladder so that a person on it faces oncoming traffic.
 - If the ladder is situated on uneven ground, always step on the high side of the ladder rungs when ascending or descending.
 - Ask your field partner (if applicable) to watch traffic and/or steady the ladder while you are mounting the unit.
 - While on the ladder, always keep one hand free to steady yourself.
- (3) Once the ladder is situated, the monitoring unit (minus the battery) is ready to be mounted. Consider the following:
 - To avoid potential equipment damage by vandals, install the monitoring unit with the camera on the topside.
 - Thread the mounting straps through the upper and lower mounting bracket holes while still on the ground, planning ahead for the direction from which you wish to operate the screwdriver.
 - It may be necessary to connect multiple straps together if the circumference of your mounting location (presumably a pole or tree) is greater than the length of a single mounting strap.
 - In some cases, it may be most convenient to connect the straps loosely around the pole or tree while standing on the ground, and then to shimmy the entire system up the pole or tree and tighten the strap as you ascend.
 - Whenever possible, use the nut-driver bit to tighten the strap clamps, rather than the screwdriver bit. The nut-driver bit is much safer and easier to use because it is self-locating, and requires far less reaching from the ladder to operate.
- (4) Once the monitoring unit is securely fastened to the pole or tree, install the battery and connect all power cords, making as many trips up and down the ladder as necessary to safely complete these tasks.
- (5) Once the battery is installed and the unit is powered-up, use the handheld video monitor to see what the camera sees by plugging it into the side of the DVR. Follow these tips when setting the camera:
 - Adjust, zoom, and/or focus the camera as necessary to capture the desired view of your monitoring location on screen.
 - Be patient! It may be necessary to alter the height of the monitoring unit to properly set the camera. Do not do so without first removing the battery and setting it in a secure location (off the ladder). It may even be necessary to choose a different mounting location altogether, or to use a different camera lens if the images on the video monitor do not show what you are hoping to capture on screen.
 - To prevent data loss, consider lighting conditions due to the path of the sun over the course of a day, and mitigate for those conditions if possible. Harsh shadows or direct sunlight can make video data difficult or impossible to process.
 - To allow for rapid data review, set the camera such that the amount of time any cyclist or pedestrian appears within the camera's recorded frame is maximized.

- Once the camera is set, make sure that the camera mounting arm is securely tightened and that the camera cannot be easily knocked out of position.
 - Clean the camera lens with a lens wipe, if necessary.
- (6) Once the monitoring unit is in place, and the camera is securely set to capture the desired view of your monitoring location, verify that the manual and DVR timers are still synchronized, and that the DVR settings remain correct and require no additional adjustments. To avoid potential memory card failures, format the SD card in the field using the DVR remote control. Do this even if the card is already blank.
 - (7) Conduct a camera test. Allow the monitoring unit to record non-motorized traffic activity for several minutes, or at least until the unit has had time to record and download three or more complete video files to the SD card. If there is no non-motorized activity within this short period of time, stage such activity yourself by walking around the sampling site. Try to stage movements that pedestrians and cyclists are likely to make within the camera's recorded frame.
 - (8) Once several minutes have elapsed, return to the monitoring unit, and verify that the system is working properly by reviewing the recently stored video files using the handheld video monitor and DVR remote control. Make any adjustments to the DVR settings or camera position as necessary, and repeat the camera test as required.
 - (9) [Optional] Replace the SD card containing the recently stored video files with a new card. Format the new card and reset the monitoring unit to resume recording using the handheld video monitor and DVR remote control. Bring the first card back to the office (or to the nearest laptop computer) to view the video test files under 'data processing conditions' (i.e., using the same reviewing software and screen size as will be used for data processing).
 - (10) Unplug and turn off the handheld video monitor; secure the DVR; and shut the mounted plastic case, all the while being careful not to knock the case or the camera out of their set positions. Use the padlock (w/ combo from the Equipment Manager) to secure the case.
 - (11) Before leaving the site, complete your equipment installation field notes. At a minimum, be sure to include the following information: arrival time, departure time, personnel, weather, equipment used, camera settings, DVR settings, manual timer settings, and any other important notes or observations pertaining to the installation.

Back at the Office

- (1) Upon your return from the field, properly store all equipment for future use; properly dispose of used batteries; and notify the Equipment Manager of any equipment repair or replacement needs.
- (2) If you opted to bring the SD card from your camera test back to the office, review the video files on it under 'data processing conditions' to verify that they can be successfully processed. Remember, someone will be watching hours of recorded data that look just like this. If there appear to be any problems that may prohibit successful data processing, consult with the Data Manager immediately, and determine whether a follow-up field visit is required to adjust the monitoring unit or its settings.

- (3) Safely store your field notes, to be completed upon your return to the sampling site for equipment removal.

Other Tips and Advice

- Before every trip to the field, plan well enough ahead to fully charge all 12V system batteries and the cordless screwdriver.
- Always keep the handheld video monitor turned off when not in use. This device drains its batteries quickly.
- When setting the DVR, use the ‘Scheduled Record’ option, and adjust the settings under the ‘Continue Record’ menu. Set the recording speed to 10 frames per second; set the maximum file size to 3 Megabytes; and use the highest resolution and image size settings as your sampling site warrants, and as your memory card has the capacity to store.
- When choosing a mounting location, carefully consider the data you wish to generate using the recorded video. Many times, the best mounting spot is located at some distance from the area to be filmed. For instance, video recorded by a camera mounted directly above an intersection must be viewed in the office at slower speeds, because the subjects being counted enter and exit the recorded frame very quickly. On the other hand, video recorded by a camera located at a distance from the intersection can be viewed at faster speeds, because the subjects being counted remain within the recorded frame for an extended period of time.
- When using multiple cameras to record video at a sampling site, carefully consider how the video data will be processed. Consult with the Data Manager to evaluate options for complementary mounting locations. Remember, the number of hours required to process data for a sampling site is directly proportional to the number of cameras used at that site.
- Conduct all field activities with a partner whenever possible, and discuss your plan of action before arriving onsite. For safety reasons, the person on the ladder should have hands free whenever possible. This means that the person on the ground should plan to be available to steady the ladder, and to assist his/her partner by handing up (or taking down) batteries, handheld monitors, tools, and other equipment as needed to safely complete an installation.

Equipment Removal Procedures

Before Leaving for the Field:

- (1) Carefully plan your equipment removal activities using lessons learned during equipment installation.
 - When planning your field schedule, consider lighting conditions, local traffic patterns, and safety concerns. For instance, it may be advantageous to schedule equipment removal to avoid periods of heavy motorized traffic.
 - Build extra time into your schedule to diagnose and address any unforeseen equipment or data problems that you may encounter while in the field.
- (2) Review the DVR User’s Manual (Appendix E). Familiarize yourself with its many functions, and how to access those functions using the handheld video monitor and DVR remote control.

- (3) Discuss possible contingencies with the Data Manager, and plan for unforeseen equipment or data problems that you may encounter while in the field. Have a plan for who will be contacted under different problem scenarios, and for how real-time decisions will be made in each case. Be prepared (if deemed necessary) to repair, reset, or re-install monitoring equipment in the event that the previously installed unit has been vandalized, or has otherwise failed, resulting in data loss.
- (4) Considering all possible contingency plans, gather the applicable items listed in the Field Preparation Checklist (below), and pack them for easy access in the field. Be sure that all devices with rechargeable batteries are fully charged, and that replacement disposable batteries are available for all other devices.

Once in the Field

- (1) For equipment removal, follow all suggested protocols related to safety, ladder placement, and ladder use as specified above for equipment installation.
- (2) Once the ladder is properly situated, ascend it; remove the padlock (w/ combo from the Equipment Manager); and open the mounted plastic case.
- (3) Conduct a system status check. Use the handheld video monitor to check the status of all system components, and report the results in your field notes. If anything appears to be awry, attempt to diagnose the problem before disassembling or removing the monitoring unit. If the battery is dead, replace it with a fresh battery, then proceed with the status check:
 - Is the system recording (on not recording) per schedule?
 - Is the camera still in focus and properly aimed?
 - Is the SD memory card at capacity?
 - Are the DVR and manual timers still synchronized?
- (4) Conduct a data scan. Upon completing the status check, use the handheld video monitor and DVR remote control to scan the data stored on the SD memory card. Verify that all expected data are present and accounted for by scanning the first and last video file from each recorded day. If data appear to be missing, or if anything else appears to be awry, attempt to diagnose the problem before disassembling or removing the monitoring unit.
- (5) If the status check or data scan reveal any apparent system malfunction, make an attempt to diagnose the problem, then implement the appropriate contingency plan. If the status check and data scan reveal no apparent problems, proceed with disassembling and removing the monitoring unit.
- (6) Remove the monitoring unit from its mounted position by reversing the steps that you took to install it, making as many trips up and down the ladder as necessary to safely complete these tasks:
 - Turn off the recording system using the handheld video monitor and DVR remote control.
 - Disconnect all power cords and remove the battery.
 - Secure the DVR and shut the mounted plastic case.
 - Remove the monitoring unit by first loosening the bottom strap, followed by the top strap, using the reverse setting on the cordless screwdriver. It may be most

- convenient to slide the entire system down the pole or tree while you descend the ladder by loosening the straps in gradual increments. Once on level ground, remove the straps entirely while holding onto the handle of the plastic case.
- (7) Before leaving the site, complete your equipment removal field notes. At a minimum, be sure to include the following information: arrival time, departure time, personnel, weather, equipment used, system status check results, data scan results, and any other important notes or observations pertaining to contingency plan implementation or equipment removal.

Back at the Office

- (1) Upon your return from the field, remove the SD memory card from the monitoring unit, and deliver it, along with your complete field notes (for both installation and removal) to the Data Manager for data processing and reporting.
- (2) Properly store all equipment for future use; properly dispose of used batteries; and notify the Equipment Manager of any equipment repair or replacement needs.

Other Tips and Advice

- Before every trip to the field, plan well enough ahead to fully charge all 12V system batteries and the cordless screwdriver.
- Always keep the handheld video monitor turned off when not in use. This device drains its batteries quickly.
- When using multiple cameras to record video at a sampling site, do not disassemble or remove any monitoring equipment until status checks and data scans have been conducted on all units, and have revealed no apparent system malfunctions.
- Conduct all field activities with a partner whenever possible, and discuss your plan of action before arriving onsite. For safety reasons, the person on the ladder should have hands free whenever possible. This means that the person on the ground should plan to be available to steady the ladder, and to assist his/her partner by handing up (or taking down) batteries, handheld monitors, tools, and other equipment as needed to safely complete an installation.

Field Preparation Checklist

Field Equipment	Monitoring Unit Components
<ul style="list-style-type: none"><input type="checkbox"/> Hard Hat & Safety Vest<input type="checkbox"/> Traffic Cones and Signs<input type="checkbox"/> Orchard Ladder (or similar)<input type="checkbox"/> Tool Belt<input type="checkbox"/> Mini Screwdrivers<input type="checkbox"/> Standard Flathead Screwdriver<input type="checkbox"/> Mounting Straps (at least 6)<input type="checkbox"/> Cordless Screwdriver (w/ socket and flathead bits)<input type="checkbox"/> AA Batteries (8) for Handheld Monitor<input type="checkbox"/> AAA Batteries (2) for Remote Control<input type="checkbox"/> CR2032 Battery for Timer<input type="checkbox"/> Lens Wipes<input type="checkbox"/> Field Notebook or Data Entry Form<input type="checkbox"/> Pen or Pencil	<ul style="list-style-type: none"><input type="checkbox"/> Camera Unit w/ DVR, Remote Control and Timer<input type="checkbox"/> Camera Lenses (if applicable)<input type="checkbox"/> 12V Battery<input type="checkbox"/> SD Cards (2) 8 GB, HC Class 6 or better<input type="checkbox"/> Handheld Video Monitor (w/ neck strap)<input type="checkbox"/> Padlock (ask Equipment Manager for combo)

Appendix D: Suggested Protocols for Data Processing and Reporting

Suggested Protocols for Data Processing and Reporting

Video Data File Storage (Data Manager)

- (1) Upon the conclusion of data collection efforts at a sampling site, field personnel will deliver all raw video data files and accompanying field notes to you (the Data Manager).
- (2) Archive the raw video data files and copies of all field notes in a secure digital folder, then place copies of those files in a working folder, which will be used during data processing activities.

Viewing Folders Containing Video Files in MS Windows (All Personnel)

For efficiency, and to avoid data processing errors, always follow these steps when viewing any folder containing video data files in MS Windows. Refer to Figure D1 for an example:

- (1) Select the 'Details' view.
- (2) Customize the view to display only 'Name', 'Size', 'Date Created' and 'Duration' by right-clicking on the column heading bar.
- (3) Sort the files by ascending 'Date Created'.

Note: if you do not sort by 'Date Created' each time you open a window, Windows may instead sort by name, which will cause the files to be displayed out of order.

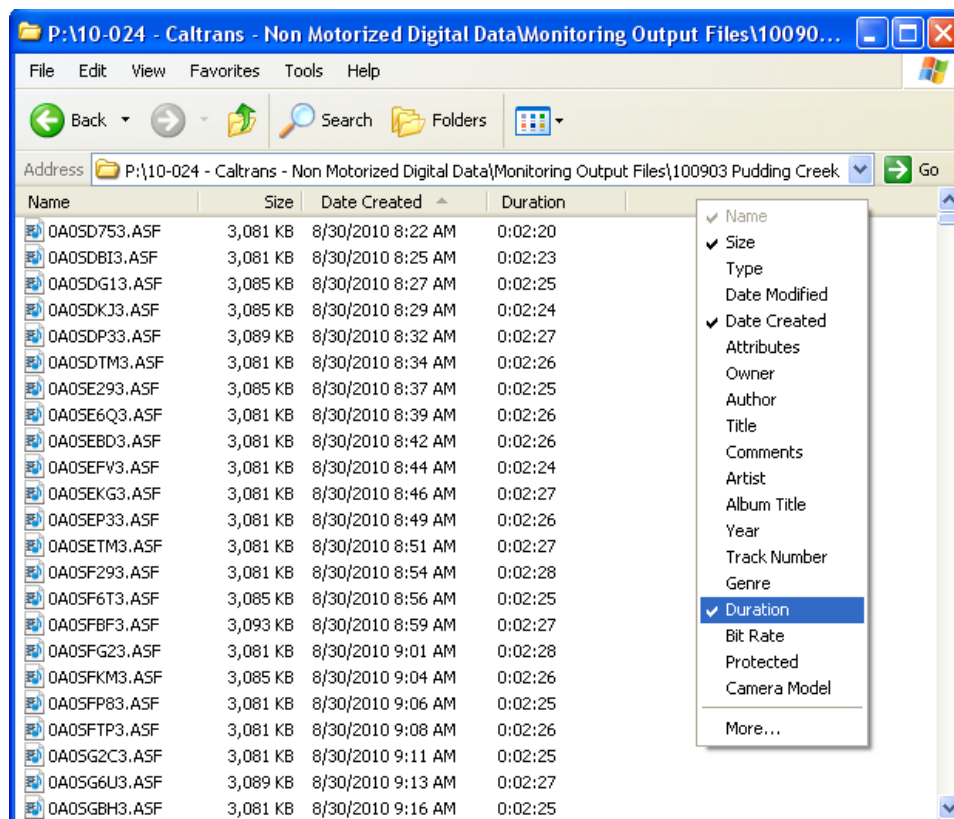


Figure D1. Typical View of Folder Containing Raw Video Data Files in MS Windows.

Data Input Workbook Setup (Data Manager)

- (1) Using available templates or workbooks created for previous data sets, create a blank Data Input Workbook (in MS Excel) for the data to be processed. The first page of the workbook should be a Data Set Summary Sheet, followed by Data Input Sheets for each day for which video files are available.
- (2) Begin to fill out the Data Set Summary Sheet for the video files to be processed. Much of the information to be initially filled out should be available in the field notes accompanying the raw data video files.
- (3) Ready the raw video data files for review and processing by sorting them in an electronic folder in the manner described above, and as illustrated in Figure D1.

Data Completeness Check (Data Manager)

- (1) Prior to the review of a data set, check and report on the completeness of the raw video data files. If you determine that the data set is not sufficiently complete, it should not be reviewed.
- (2) While viewing a folder containing the raw video data files in MS Windows, visually inspect the 'Size' column, looking for any discrepancies. All files in the folder should be the same size (e.g., approximately 3 MB). Using Windows Media Player (v.11) in the manner described below, and as illustrated in Figures D2 and D3, view any file that is not appropriately sized – as well as one file before and one file after – to determine whether any video data are missing. Missing data can be detected by carefully tracking the time-stamp at the bottom of the video images.
- (3) Visually inspect the 'Duration' column, looking for any discrepancies. Over the course of a day, the duration of video files may vary significantly, due to changing light conditions and traffic activity at the sampling site. However, the duration of any single video file should be similar to the files recorded immediately before and after it. Using Windows Media Player (v.11), view any file that appears to be suspiciously too short or too long – as well as one file before and one file after – to determine whether any video data are missing.
- (4) Visually inspect the 'Date Created' column, looking for any discrepancies. The time listed for the first file in each recorded day should match the time the camera was set to begin recording, as indicated in the field notes. Likewise, the time listed for the last file in each recorded day should be slightly earlier than the time the camera was set to stop recording.
- (5) Using Windows Media Player (v.11), view the first file and the last file of each day to determine whether any video data are missing within the intended interval for each recorded day. Also, in preparation for determining an appropriate 'design day' for the sampling site, take note of the lighting conditions at the beginning and end of each recorded day.
- (6) Based on the exercises above, quantify any video data that appear to be missing from the data set (in terms of minutes and seconds). Once a Data Input Workbook is available for the data set, report your findings in the 'Notes' column of the Data Input Sheets for each day.

Design Day Determination (Data Manager)

- (1) Prior to any data processing, specify an appropriate 'design day' for the data set. Unless otherwise specified in the sampling design, the length of a design day should be 13 consecutive hours. The designated beginning and end of the design day will be a function of available video data, lighting conditions at the site when the data were recorded, and the timing of targeted traffic events.
- (2) Using Windows Media Player (v.11), view several files toward the beginning and end of each recorded day to determine the most appropriate design day for the data set.
- (3) Once the design day has been established, the fill out all relevant fields in the Data Set Summary Sheet, including 'Total Time Sampled', 'Total Memory Used', and '% Data Completeness' for the sampled interval.

Data Input Sheet Preparation (Data Manager)

Prepare a Data Input Sheet in the Data Input Workbook for each day for which raw video data files are available. Each sheet should contain the same number of rows and columns, constructed as follows:

- (1) Unless otherwise specified in the sampling design, each row in the data sheet should represent a 15-minute interval of recorded time.
- (2) The columns in the data sheets will vary from site to site. Based on conversations with field personnel, your knowledge of the site, and your experience with video files viewed so far, create columns to capture all possible pedestrian and cyclist movements at the sampling site, as well as any other parameters specified in the sampling design for characterizing non-motorized traffic users.
- (3) To assist the Data reviewer, fill all rows in each Data Input Sheet (minus the first and last cells in each row) according to the following color codes.

White =	Video data are available for this interval
Gray =	No video data are available for this interval
Light Blue =	Video data are available for this interval, but the interval is outside the designated design day or sampling period.
- (4) Where the data completeness check revealed missing data in any 15-minute interval, fill the first cell in the appropriate row in the Data Input Sheet with pink, and indicate in the 'Notes' column how many minutes and seconds are missing in the interval.
- (5) Select two or more hours of consecutive video files to be used for an accuracy check. Each hour may come from a different recorded day. Using the protocols described below, process the video and record non-motorized traffic data for those hours, and save the results on copies of the appropriate Data Input Sheets. Your results will later be compared to results generated by the Data Reviewer for the same hours.
- (6) After discussing the results of the accuracy check with the Data Reviewer, make any needed adjustments to the Data Input Sheets or reviewing protocols; decide whether additional checks should be performed to ensure data quality and consistency; and proceed accordingly.

Viewing Video Files Using Windows Media Player (v.11) (All Personnel)

- (1) To view a number of files consecutively, select the files from a MS Windows folder by clicking on the first of the series, then clicking on the last of the series while pressing SHIFT on your keyboard. Refer to Figure D2 for an example.
- (2) Once the files have been selected, right click on the first file, and select 'Add to Windows Media Player list' to view them. Refer to Figure D2 for an example.

Note: If you do not right click on the first file, Windows Media Player will queue and play the files out of order.

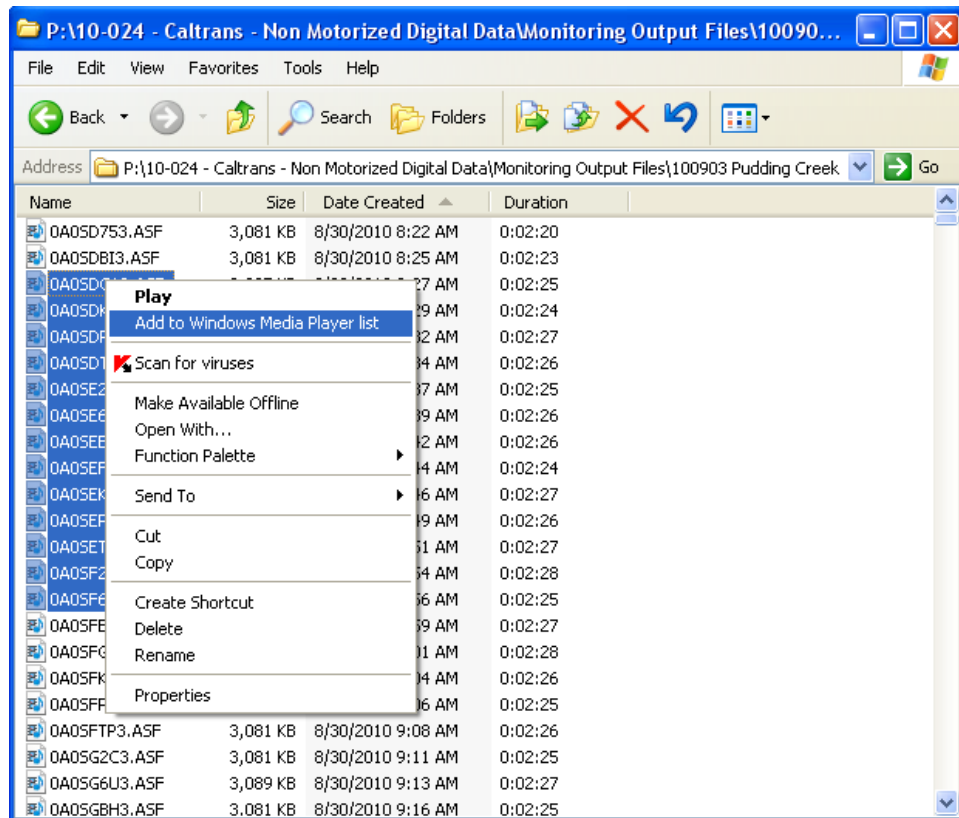


Figure D2. Selecting Consecutive Video Files from a Windows Folder for Viewing with Windows Media Player.

- (3) Upon selecting 'Add to Windows Media Player list', Windows Media Player will open automatically (if it is not already open), and will begin playing the files in consecutive order. Refer to Figure D3 for an example.
- (4) Configure Windows Media Player to be viewed in 'Full Mode' with the 'play list' on the right of the viewing window, and with the 'Play Speed Settings' enhancement below the viewing window. Refer to Figure D3 for an example.

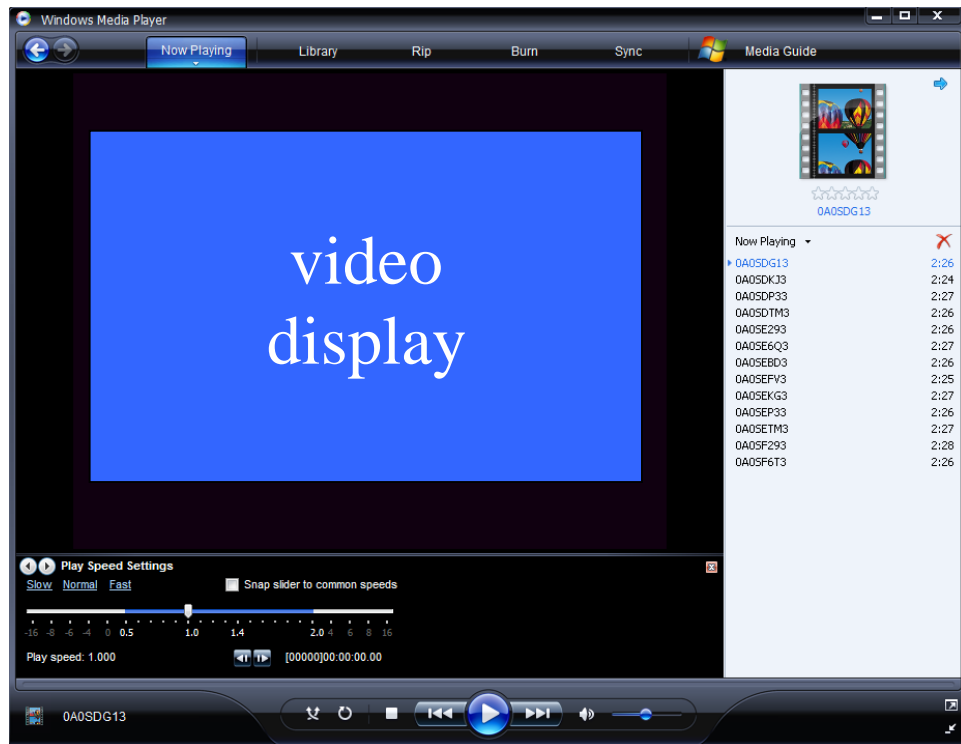


Figure D3. Typical ‘Full Mode’ View of Windows Media Player (v.11) with ‘Play List’ and ‘Play Speed Settings’ Enhancement.

- (5) Use the buttons on Windows Media Player to play, pause, fast-forward, rewind, speed up, or slow down video images, or to select video files from the play list. For best results, and to maximize efficiency, familiarize yourself with all the available features of Windows Media Player (v.11) before processing video data.

Note: Many of Windows Media Player’s features can be accessed using time-saving shortcut keys, some of which include:

VIEW FULL MODE	CTRL + 1
VIEW FULL SCREEN	ALT + ENTER
PLAY	CTRL + P
PAUSE	CTRL + P
STOP	CTRL + S
FAST-FORWARD	CTRL + SHIFT + F
REWIND	CTRL + SHIFT + B
NORMAL PLAY	CTRL + SHIFT + N
SLOW PLAY	CTRL + SHIFT + S
FAST PLAY	CTRL + SHIFT + G

Data Processing and Recording (Data Reviewer)

- (1) While processing video files and recording non-motorized traffic data, follow suggested protocols (above) for viewing folders containing video files in MS Windows, and for viewing video files using Windows Media Player (v.11).
- (2) View all video files for each design day in the sampling interval with the appropriate Data Input Sheet open on your computer desktop. Toggle between Windows Media Player and MS Excel as necessary to process video and to record non-motorized traffic data.
- (3) While watching video files, enter the total number of observed traffic events in the appropriate row of the Data Input Sheet for each 15-minute increment, pausing Windows Media Player as necessary to accurately record the results.
- (4) Ask the Data Manager which intervals he/she selected for the accuracy check, and begin your efforts by processing video and recording data for those intervals. Compare your results with the Data Manager's results; discuss and address any discrepancies; and make any needed adjustments to the Data Input Sheets or reviewing protocols. Proceed with data processing, or with additional accuracy checks as directed by the Data Manager.
- (5) Once all video files in the sampling interval have been processed, and all data recorded, submit the completed Data Input Workbook to the Data Manager for review and approval. Make note of any issues or questions the Data Manager should consider while performing his/her review.
- (6) To ensure efficiency, follow these additional tips for data processing and recording:
 - Discuss with the Data Manager how to properly record nuanced traffic events, either in advance of data processing, or as those events are observed. For example, have a plan for whether and how to document illegal traffic movements by cyclists and pedestrians, horseback riders, motorized and non-motorized wheelchair users, skateboarders, scooters, tandem bike riders, etc. When in doubt, count all such traffic, and enter a brief description of each event (along with the specific time at which it occurred) under the 'Notes' column in the appropriate row of the Data Input Sheet.
 - View and process video data in manageable batches. That is, add video files to the Windows Media Player play list in batches of one or two recorded hours (i.e., four to eight consecutive 15-minute increments) at a time. Once those files have been viewed and processed, clear the play list and add the next batch.
 - View each Data Input Sheet using the split screen option in MS Excel, so the column headings are always present at the top of the sheet during data entry.
 - Take regular breaks while reviewing and processing data as necessary to rest your eyes. During these breaks, take turns focusing on objects at far-away distances.

Data Review, Correction and Approval (Data Manager)

- (1) Upon receiving the completed Data Input Workbook from the Data Reviewer, open the workbook and review each Data Input Sheet for the following:
 - Does each sheet have the same rows and columns as originally constructed?
 - Do all the rows within the designated sampling interval contain data?
 - Do any comments listed in the ‘Notes’ column require further action or review?
 - (If applicable) Does the total number of cyclists recorded for each 15-minute interval equal the total number of tourists-*plus*-commuters and/or the total number of helmets-*plus*-no helmets-*plus*-non-detects recorded for the same interval?
- (2) Upon discovering any potential error or discrepancy in the completed Data Input Workbook, proceed with one of the following options:
 - Correct the error or discrepancy yourself by reviewing the subject video files, and notify the Data Reviewer of any changes to the recorded data.
 - Return the appropriate Input Data Sheet(s) to the Data Reviewer to be corrected and resubmitted for your review.
 - Discuss the error or discrepancy with the Data Reviewer to determine an appropriate course of corrective action.
- (3) Upon the correction of all errors and discrepancies in the completed Data Input Sheets, complete the Data Set Summary Sheet; approve and archive the Data Input Workbook in a secure digital folder, along with the original raw video data files and copies of the original field notes; and deliver a copy of the approved Data Input Workbook to the data user.

Appendix E: Excerpts from Digital Video Recorder (DVR) User's Manual

5. OPERATION

5.1 Power On

1. To power-up, connect to a DC 12V power input connector.

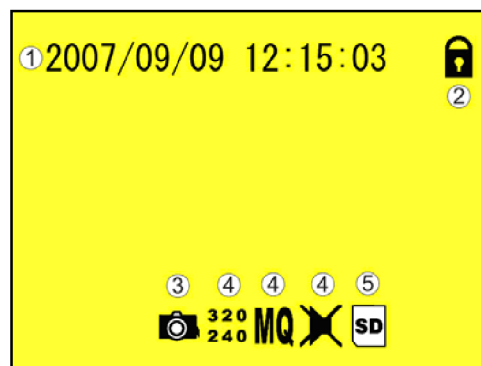
NOTE 1: Each time after power-on, the system auto-detects its peripherals. When the REC LED flashes indicate that the SD card is proceeding testing (complete boot time is several seconds) When an image file error has been detected, the system will initiate auto repairing.

2. After power on, the system auto enters live monitoring. When the system is currently under schedule recording, it auto enters record mode.
3. “SD” icon shown on the status line, indicates that SD card is operating normally.
4. When SD card is not inserted or problem occurs on the SD card. Rec indicator will flash quickly. Please re-format before proceeding.
5. You can play while the SD card is “read only”, but you cannot record; and Rec indicator will flash quickly.
6. After power-loss the system auto returns to the previous recording mode.

⚠ Do not withdraw the CF card while booting. It may destroy the data stored within the CF card.


5.2 Live Mode


Live mode is the default setup after system start-up.




- ① **Time Display:** System Date and Time.
- ② **Button Lock:** Indicates all buttons are locked (buttons are ineffective).
- ③ **Video Status:** Indicates external camera connection.

④ **Record Status:** Manual Record Parameter.


 : Record Size, please refer to 【7.4 Record Setup】 for VIDEO SIZE setup.

 : Record Quality, please refer to 【7.4 Record Setup】 for VIDEO QUALITY setup.

 : Audio Off Record, please refer to 【7.4 Record Setup】 for AUDIO RECORD setup.


⑤ **SD Card Status:**

 : SD Card has not been inserted or malfunction.

 : SD Card is proceeding file testing.

 : SD Card is functioning normally.

 : Overwrite record.

 When SD card is not inserted, record and playback function is inapplicable, but monitoring is applicable.

5.3 Record Mode

1. Start Record: 3 Types of recording mode.

(1) **Manual Record:** Suitable to record at anytime. Press 《Rec ●》 button, to enter manual recording status (start recording). For more information, please refer to 【7.4 Manual Record & Schedule Record】.

(2) **Motion Detection Record:** Suitable to record, when there are severe image changes. Motion detection triggers schedule recording, but it will only start recording when the variation exceeds the alarm limitation value. For more information, please refer to 【7.3 Motion Detection】 and 【7.4 Manual Record & Schedule Record】.

(3) **Continuous Record:** Suitable for few constant frame recording or on long-term continuous recording. For more information, please refer to 【7.4 Manual Record & Schedule Record】.

(4) **Alarm Record:** Suitable for external alarm recording. When alarm schedule been setup, alarm icon will be shown on the display status bar (alarm triggered recording is setup).

2. Stop Record:

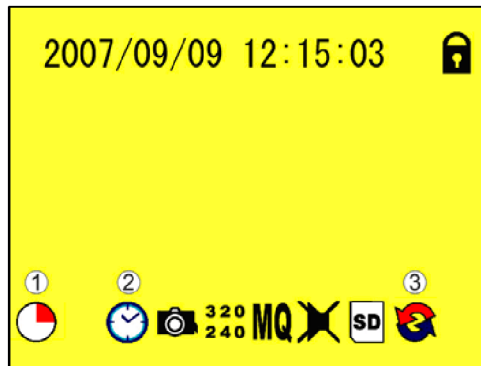
Manual Record Press 《■/□》 button/ Manual Power-Off/ Auto Power-Off when System Power Shortage.

Schedule Record Enter 《▶/||》 schedule recording, all kinds of recordings (Alarm/ Motion Detection/ Continuous) will be stopped.


To continue recording, please follow the methods below to restart recording.

Manual Record	Repress 《●》 button.
Schedule Record	Stop playback and the system will auto re-check the record schedule setup again.

3. Record Display:




① Record Status:

 : Indicates recording is in progress.




② Record Mode:

 : Manual Record  : Schedule Record
 : Motion Detection Record  : Alarm Record

③ Record Storage Mode Status:

 : Continuous Record
% : Remaining Storage Capacity

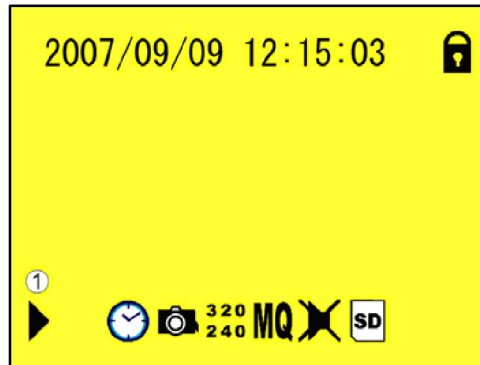
4. System recording is determined according to the recording priority order (Record Priority: Manual/ Alarm/ Motion Detection/ Continuous).
5. Different recording modes may have different kinds of setups. Basic setup: video size, recording frames, video quality, and audio recording. When different recording modes are triggered, the system starts recording according to the different setup. This kind of design provides flexibility to ensure efficient recording time and quality. Example: Work hour from 8:00am to 6:00pm, setup「Schedule Record」to low video quality with less recording frames to extend the recording time. And off work hour, setup「Motion Detection Record/ Alarm Record」to enable high video quality with the highest recording frames, when an event occurs.
6. Video or audio may be recorded into the SD card (SD card is purchased separately).

-  Do not withdraw the SD card while recording. It may destroy the data stored within the SD card.
-  Power loss during recording results incomplete videos or errors.
-  Video loss during recording, the system stops recording, backups the files, and when the videos are normal again, the system will continue recording.

5.4 Playback Mode

Selectable Playback format: Continuous Playback and Searching Playback.

(1) **Normal Playback:** Press 《▶/||》 button to first playback the final recorded data, and then according to the SD card file recording order.



① Playback Status:

- ▶ : Press 《▶/||》 button once to playback, press it again to pause.
- ◀▶ : Press 《◀》 or 《▶》 button to Fast Rewind or Fast Forward (Speed: x2/ x4/ x8/ x16/ x32). Press 《▶/||》 button to return to normal speed playback.
- || : During playback, press 《▶/||》 button to pause playback and press again to return to playback status.
- ◀▶▶ : During pause, press 《◀》 or 《▶》 button to step back one frame or to step forward one frame and press 《▶/||》 button to return to normal speed playback.





Press 《■/□》 button to stop playback function and to return to live status.

(2) **Search and Playback:** Enter MENU and select 【SEARCH AND PLAY】 item.



- ① File directory shows dates and the amount of contents under the directory. The user may press 《▲》 or 《▼》 button to move the cursor up or down.
- ② Current location page.

③ Event Record Status Icon:

 : Manual  : Motion Detection  : Continuous  : Alarm
(NOTE 1 & NOTE 2).

- ④ Each color distinguishing different recording events, the user may press 《 ◀ 》 or 《 ▶ 》 button to move the cursor left or right and immediately shows the first image of the highlighted event on the screen display background.
- ⑤ Displays the time highlighted by the event bar.

☛NOTE 1 : Select the starting point and press 《Enter》 button to playback.

☛NOTE 2 : Press 《 ■ / □ 》 button to stop playback and the system will return to 【SEARCH and PLAY】 selection and enables the user to select the preferred input source.

⚠ The device supports playback only to images recorded by our device, other ASF video files are not guaranteed.

5.5 PC Playback

1. The device uses SD card as its main storage. User may read the data stored in the SD card from the computers that supports SD card reader device.
2. All files (under DVMPG4 folder) has approximate size of 1MB and file names are ordered according to recorded times (sequence).

File Playback: User may use Microsoft®—Media Player or DivX—DivX Player (<http://www.divx.com/>) to playback video files.

⚠ When first time using Media Player to playback, it requires the most updated decoder from the Microsoft® software website.

5.6 SD Card Maintenance

1. The device supports only FAT16/ 32 file system; therefore it is unable to determine other file systems. Please format the SD card (enter 【MENU/ SD CARD OPTIONS】 and select “Format”).
2. The system supports only partial SD card file system repair. The system is unable to detect any file system damage, therefore please format the SD card (enter 【MENU/ SD CARD OPTIONS】 and select “Format”).

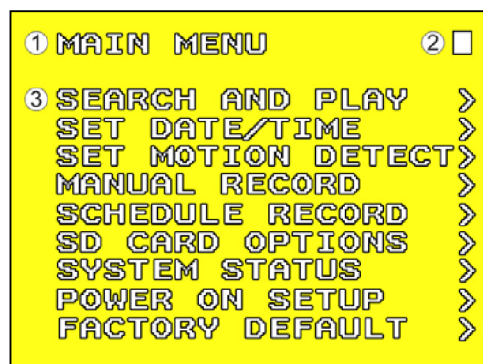
5.7 How to Download the Updated Software

1. Use the SD card to update your system firmware.
2. Please follow the steps below to update the software:
 - (1) Copy the new system firmware into the new directory of the SD card from your computer.
 - (2) Insert the SD card; switch off the main power and then restart.
 - (3) Wait for 5 to 6 seconds, the system update will be complete and return to live mode.

⚠ Do not withdraw the SD card while booting, when power-loss occurs while proceeding step (3), please repeat step (2) and (3).

6. MENU SETUP

6.1 Main Menu



- ① **MAIN MENU:** Item subject.
② **Menu Layer Indication:** The device consists of three menu layers.

■ : First Menu Layer (Main Menu)
■■ : Second Menu Layer
■■■ : Third Menu Layer

- ③ **MENU Content:** Basic Menu Operations.

Press 《▲》 or 《▼》 button, to select the item.

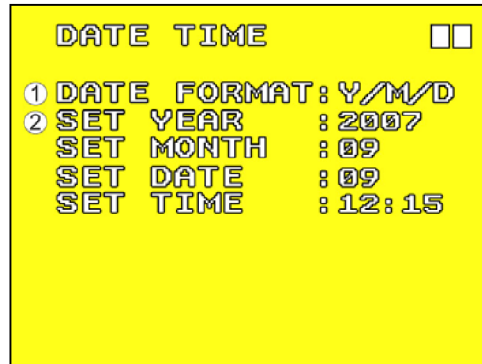
Press 《ENTER》 button, to enter the sub menu (>).

Press 《■/□》 button:

- Under second or third menu layer, the system will return to the previous menu layer (second layer to first layer or third layer to second layer).
- Under main menu (first menu layer), the system will enter live mode. Press《◀》 or 《▶》 button, to increase or decrease the setting value of the item selected (NOTE 1).

☛ NOTE 1: All words underlined and bold indicates 「Default Value」.

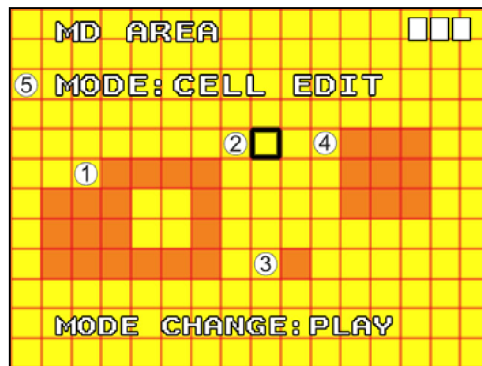
6.2 Date/ Time



- ①Date Format : Y/M/D M/D/Y D/M/Y
②Date/ Time Adjustment : Year Setup: 2000 - 2099
Month Setup: 01 - 12
Time Setup: 00 : 00 - 23 : 59
Return to factory default, no changes will be made.

6.3 Motion Detection

1. Window Setup:



- ① Detection Block: Formed by two or more cells.
② Cursor: Press 《 ▶/II 》 button to switch to Select/ Edit mode.
③ Detection Cell: The whole screen is divided into 16x12 cells.
④ Detection Block.
2. Cursor Movement: Press 《 ▶/II 》 button to switch to setup mode (cursor color is black), press 《 ▲/▼/◀/▶ 》 button to move the cursor freely.

3. Motion Detection Area Setup:

(1) Press 《 ▶/II 》 button to edit detection block.

⑤ Mode

CELL EDIT Single detection cell setup (detection/ non-detection)

DEL BLOCK Disable a block

DEL ALL Delete all cells

ADD BLOCK Enable a block

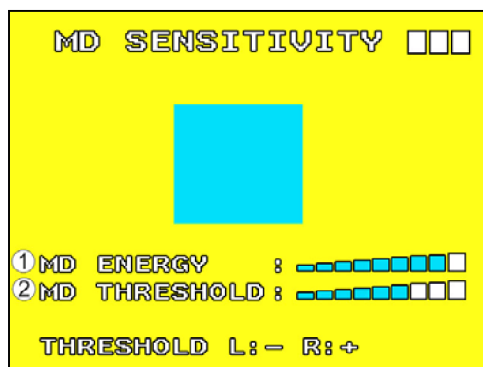
ADD ALL Enable all cells

(2) Press 《 ▶/II 》 button to switch cursor to edit mode (cursor color is pink). Press 《 ▲/▼/◀/▶ 》 button, follow step (1) to change the size of the detection block.

(3) Detection area is shown by color red, press 《Enter》 to enable/ disable the detection block.

4. Motion Detection Sensitivity Setup:

Changing the alert value may affect the recording sensitivity of the Motion Detection.



① **MD ENERGY** : Reveals current sensitivity rate (NOTE 1).

② **MD THRESHOLD** : Reveals user sensitivity rate setup. Press 《 ◀ 》 or 《 ▶ 》 button, to change the motion detection threshold level (NOTE 2).

☛NOTE 1: Motion detection is triggered when MD ENERGY level exceeds MD THRESHOLD level (red block).

☛NOTE 2: The red cells reveals the setup made by the user.

6.4 Record Setup

Selectable manual or schedule recording, basic setups are shown below:

1. MANUAL RECORD: Press (●) button to start recording (NOTE 1).



①Video Size/ Frame Rate Setup:

VIDEO SIZE	<u>320x240</u>	640x480
FRAME RATE (MAX)	30 fps	12 fps

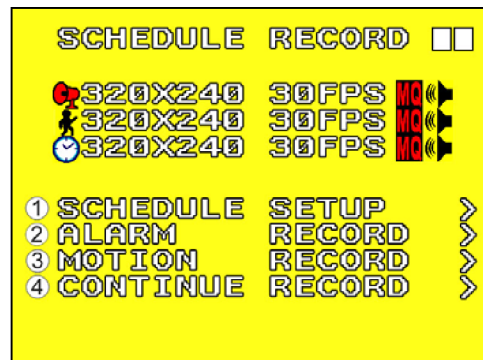
②Image Quality:

HIGH	Using high recording quality (More CF card storage capacity will be required).
MEDIUM	Using medium recording quality.
LOW	Using low recording quality (Less CF card storage capacity will be required).

③Audio Record: **Enable** or disable audio recording.

☛ NOTE 1: Menu setup is inapplicable during manual recording.

2. SCHEDULE RECORD (Alarm Detection/ Motion Detection/ Continue): Records only within the setup time range.



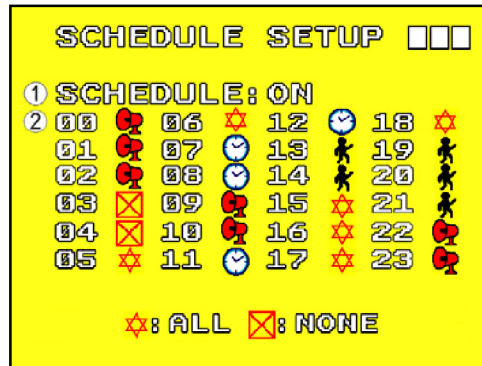
① SCHEDULE SETUP : Enable/ Disable schedule and record mode setup.

② ALARM RECORD : Alarm setup.

③ MOTION RECORD : Motion detection setup.

④ CONTINUE RECORD : Continuous setup.

(1) SCHEDULE SETUP :



- ① SCHEDULE : Record ON / OFF setup (default setup is OFF).
 ② SCHEDULE MODE : Press $\langle \blacktriangle \rangle$ or $\langle \blacktriangledown \rangle$ to setup schedule time. Press $\langle \blacktriangleleft \rangle$ or $\langle \blacktriangleright \rangle$ to setup different types of recording schedule. (★ : Motion Detection Record ⌚ : Continuous Record 🚨 : Alarm Triggered Record).

(2) Increase setup during Alarm Detection:



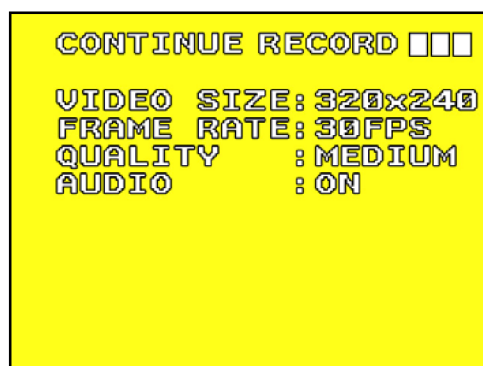
- ① DURATION : Duration time when motion detection has been triggered (05 ~ 90 SEC (increase by every 5 SEC) / 10 SEC).
 ② ALARM INPUT : Alarm trigger method (N.C./N.O.).

(3) Increase DURATION setup during Motion Detection Record:



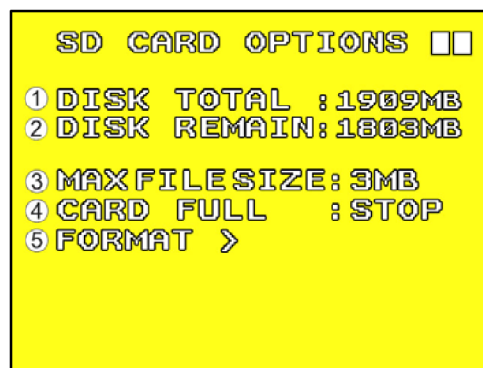
- ① CONTINUOUS RECORD : Continuous record time when motion detection has been triggered (05 ~ 90 SEC (increase by every 5 SEC) / 10 SEC).

(4) CONTINUE RECORD:



Setup method is similar to manual record setup, for more information please refer to [7.4 1. MANUAL RECORD].

6.5 SD Card Options



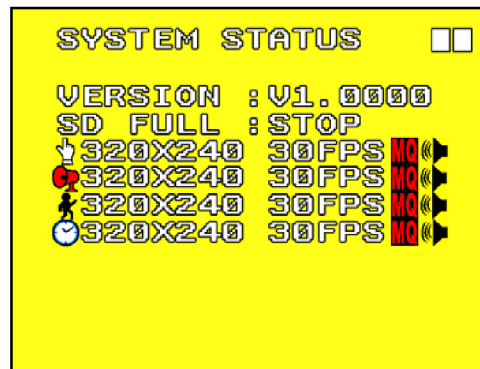
① **TOTAL SPACE** : SD card total capacity.

② **REMAIN SPACE** : SD card remaining capacity.

☛ NOTE 1: Proceeding continuous recording, old videos can be deleted and overwritten. Please confirm before setup.

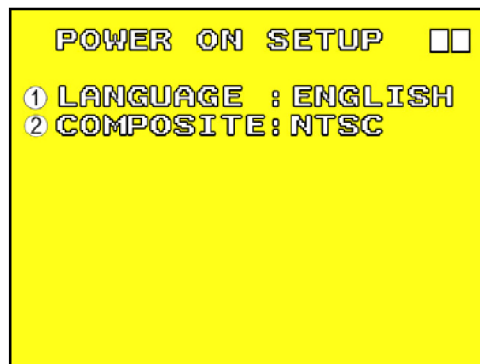
☛ NOTE 2: Recording time depend on the SD card capacity, different recording modes, and degree of video variation.

6.6 System Status



Press any button to return to the Main Menu.

6.7 Power On Setup

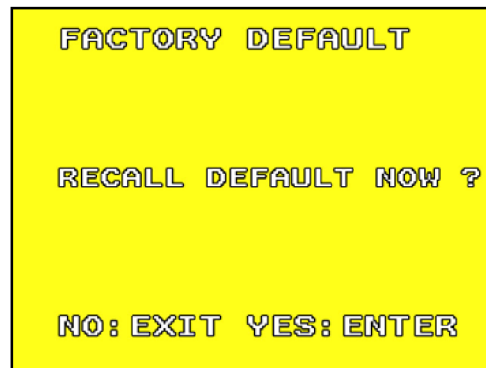


① **LANGUAGE** : Setup menu language.

② **COMPOSITE** : Setup video output format, **NTSC**/ PAL (NOTE 1).

☛ NOTE 1: Connect the camera, the device auto detects NTSC/ PAL video system (the output video system will be setup the same as its input video system). Without connecting the camera, the video system setup will be the same as its previous setup.

6.8 Factory Default



Press 《Enter》 button, returns all settings to the factory default value (NOTE 1).

Press 《■/□》 button, exit this screen display and returns to the Main Menu.

☛ NOTE 1: Return to factory default will erase all configuration values and return to the Factory Default values (except Date and Time setup) . Therefore, confirm before you proceed.

7. TROUBLE SHOOTING

Q1. What is the recording capacity for 1GB SD card?

A1. Different recording setup has different recording capacity. Table below shows possible recording time during continues recording applying different record mode.

Quality	Frame Rate	SD Card	High		Medium		Low	
VGA (640 x 480)	12 FPS	1 GB	155	min	280	min	340	min
QVGA (320 x 240)	30 FPS	1 GB	150	min	380	min	600	min

Q2. Why does the system auto reboot during normal operation?

A2. It indicates that the SD card error has been detected. To enable data completeness, monitoring procedure will reboot the device. After device reboot the system returns to the status before reboot (Ex.: returns to Manual Record or Schedule Record).

Q3. Why won't the drag scroll work when playback on PC?

A3. To solve this problem, please download "AsfTools" (<http://www.geocities.com/myasftools>).

9. SPECIFICATION

STANDARD FUNCTION		
Video	System	NTSC / PAL Video System and Video Loss Auto Detection
	Codec	MPEG4-SP ASF File Format
	Record Frame Rate	1, 2, ... , Maximum fps selectable Maximum: 30 fps@320x240 / 12 fps@640x480
	Record Quality	Low / Medium / High
	Recording Date/Time	Overlay with Video Images in ASF File
	Input	1 CH Composite Video Line In
	Output	1 CH Composite Video Line Out
Audio	Sampling Rate	44.1 KHz
	Codec	G.726/ 32 kbps
	Input	1 CH Audio Line In
	Output	1 CH Audio Line Out
Audio Device		Microphone , Speak , Earphone
Storage Media		SD Card (FAT16/ 32) MAX FILES: 16384 FILES
Serial Port		USB 1.1 (Read-Only)
Recording Mode		Manual / Schedule (Alarm / Motion Detection / Continue)
Motion Detection Setting		Multiple Blocks and adjustable sensitivity
Event Search Function		Property and first image of selected file is displayed
Playback Function		Play/Fast Forward/Fast Rewind/Pause/Step Forward/Step Backward
Playback Speed		x1/ x2/ x4/ x8/ x16/ x32
Power Supply		DC 12V/1A
Dimensions		38 mm (W) x 17.5 mm (H) x 38 mm (D)
Operating Environment		30%~80% RH, 5°C ~ 45°C (41°F ~ 113°F)
Storage Environment		30%~90% RH, 0°C ~ 50°C (32°F ~ 122°F)

(Note: Design and Specifications are subject to change without notice.)

Appendix F: Traffic Data Summaries

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: MANILA

Camera No. 1
 Site Location: HWY 255 @ Lupin Drive (Manila)
 Photo Log Location: Frame = 297 (HUM 255 N)

Time of Installation: 8/13/2010 12:32
 Personnel: DAK, OFG
 Time of Take-down: 8/16/2010 14:14
 Personnel: DAK
 Total Time Installed: 74 hours

Design Day Start: 06:00
 Design Day End: 19:00

Sampling Interval Start: 8/13/10 14:00
 Sampling Interval End: 8/16/10 14:00

Total Time Sampled: 39 hours
 Total Memory Used: 535 MB
 % Data Completeness: 99%




Camera Type / Lens: BW / 3.6 mm
 Video Size: 320 x 240
 Frame Rate: 10 fps
 Resolution: Low

Date(s) Processed: ---
 Data Processor: TMW

Date(s) Checked: ---
 Data Checker: DAK

Total Ped Events: 96
 Total Cyclist Events: 94

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: INDIANOLA

Camera No. 1
 Site Location: HWY 101 @ Indianola Cutoff (Eureka)
 Photo Log Location: Frame = 8027 (HUM 101 N)

Time of Installation: 8/13/2010 12:55
 Personnel: DAK, OFG
 Time of Take-down: 8/16/2010 14:40
 Personnel: DAK
 Total Time Installed: 74 hours

Design Day Start: 06:00
 Design Day End: 19:00

Sampling Interval Start: 8/13/10 13:00
 Sampling Interval End: 8/16/10 13:00

Total Time Sampled: 39 hours
 Total Memory Used: 1,475 MB
 % Data Completeness: 99%




Camera Type / Lens: Color / varifocal
 Video Size: 320 x 240
 Frame Rate: 10 fps
 Resolution: Low

Date(s) Processed: ---
 Data Processor: TMW

Date(s) Checked: ---
 Data Checker: DAK

Total Ped Events: 10
 Total Cyclist Events: 167

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: HIOUCHI

Camera No. 1
 Site Location: HWY 199 @ Downtown Hiouchi
 Photo Log Location: n/a

Camera Type / Lens: BW / 8mm
 Video Size: 320 x 240
 Frame Rate: 10 fps
 Resolution: Low

Time of Installation: 8/17/2010 09:28 8/17/10 09:30
 Personnel: DAK, TMW
 Time of Take-down: 8/20/2010 10:28
 Personnel: OFG
 Total Time Installed: 73 hours

Date(s) Processed: ---
 Data Processor: LH

Design Day Start: 06:30
 Design Day End: 19:30




Date(s) Checked: ---
 Data Checker: DAK

Sampling Interval Start: 8/17/10 09:30
 Sampling Interval End: 8/20/10 09:30

Total Ped Events: 353
 Total Cyclist Events: 49

Total Time Sampled: 39 hours
 Total Memory Used: 1,140 MB
 % Data Completeness: 99%

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: WABASH

Camera No. 1 (NE)
 Site Location: HWY 101 @ Wabash Ave. (Eureka)
 Photo Log Location: Frame = 7495 (HUM 101 N)

Time of Installation: 8/24/2010 14:40
 Personnel: TMW, OFG
 Time of Take-down: 8/27/2010 14:52
 Personnel: TMW, OFG
 Total Time Installed: 72 hours

Design Day Start: 06:30
 Design Day End: 19:30

Sampling Interval Start: 8/24/10 15:00
 Sampling Interval End: 8/27/10 15:00

Total Time Sampled: 39 hours
 Total Memory Used: 2,729 MB
 % Data Completeness: 99%




Camera Type / Lens: Color / varifocal
 Video Size: 320 x 240
 Frame Rate: 10 fps
 Resolution: Medium

Date(s) Processed: ---
 Data Processor: LH

Date(s) Checked: ---
 Data Checker: DAK

Total Ped Events: 2858
 Total Cyclist Events: 556

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: WABASH

Camera No. 2 (SE)
 Site Location: HWY 101 @ Wabash Ave. (Eureka)
 Photo Log Location: Frame = 7495 (HUM 101 N)

Time of Installation: 8/24/2010 13:39
 Personnel: TMW, OFG
 Time of Take-down: 8/27/2010 15:08
 Personnel: TMW, OFG
 Total Time Installed: 74 hours

Design Day Start: 06:30
 Design Day End: 19:30

Sampling Interval Start: 8/24/10 15:00
 Sampling Interval End: 8/27/10 15:00

Total Time Sampled: 39 hours
 Total Memory Used: 1,607 MB
 % Data Completeness: 99%




Camera Type / Lens: BW / 3.6mm
 Video Size: 320 x 240
 Frame Rate: 10 fps
 Resolution: Medium

Date(s) Processed: ---
 Data Processor: LH

Date(s) Checked: ---
 Data Checker: DAK

Total Ped Events: 2858
 Total Cyclist Events: 556

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: PUDDING CREEK

Camera No. 1
 Site Location: HWY 1 @ Pudding Creek Bridge (Fort Bragg)
 Photo Log Location: Frame = 4273 (MEN 001 S)

Time of Installation: 8/30/2010 09:22
 Personnel: TMW, OFG
 Time of Take-down: 9/3/2010 08:15
 Personnel: TMW, OFG
 Total Time Installed: 95 hours

Design Day Start: 06:15
 Design Day End: 19:15

Sampling Interval Start: 8/31/10 06:15
 Sampling Interval End: 9/2/10 19:15

Total Time Sampled: 39 hours
 Total Memory Used: 2,996 MB
 % Data Completeness: 99%




Camera Type / Lens: Color / varifocal
 Video Size: 320 x 240
 Frame Rate: 10 fps
 Resolution: Medium

Date(s) Processed: ---
 Data Processor: RCM

Date(s) Checked: ---
 Data Checker: DAK

Total Ped Events: 129
 Total Cyclist Events: 134

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: DOWNTOWN FORT BRAGG
Camera No. 1 (SE)
Site Location: HWY 1 @ Lupin Drive (Fort Bragg)
Photo Log Location: Frame = 4335 (MEN 001 S)

Time of Installation: 8/30/2010 08:44
Personnel: TMW, OFG
Time of Take-down: 9/3/2010 07:42
Personnel: TMW, OFG
Total Time Installed: 95 hours

Design Day Start: 06:00
Design Day End: 19:00

Sampling Interval Start: 8/30/10 08:00
Sampling Interval End: 9/2/10 08:00

Total Time Sampled: 39 hours
Total Memory Used: 2,192 MB
% Data Completeness: 98%




Camera Type / Lens: Color / varifocal
Video Size: 320 x 240
Frame Rate: 10 fps
Resolution: Medium

Date(s) Processed: ---
Data Processor: LH

Date(s) Checked: ---
Data Checker: DAK

Total Ped Events: 4110
Total Cyclist Events: 326

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

Non-motorized Traffic Count - Data Set Summary Sheet

Site Name: DOWNTOWN FORT BRAGG
Camera No. 2 (SW)
Site Location: HWY 1 @ Lupin Drive (Fort Bragg)
Photo Log Location: Frame = 4335 (MEN 001 S)

Time of Installation: 8/30/2010 07:56
Personnel: TMW, OFG
Time of Take-down: 9/3/2010 07:22
Personnel: TMW, OFG
Total Time Installed: 95 hours

Design Day Start: 06:00
Design Day End: 19:00

Sampling Interval Start: 8/30/10 08:00
Sampling Interval End: 9/2/10 08:00

Total Time Sampled: 39 hours
Total Memory Used: 1,553 MB
% Data Completeness: 98%




Camera Type / Lens: BW / 3.6mm
Video Size: 320 x 240
Frame Rate: 10 fps
Resolution: Medium

Date(s) Processed: ---
Data Processor: LH

Date(s) Checked: ---
Data Checker: DAK

Total Ped Events: 4110
Total Cyclist Events: 326

Legend:

 Data missing this interval
 No recorded data
 Recorded data outside sampling interval

Notes:

**Appendix G: Encroachment Permit No.
0110-N-MC-0298**

ENCROACHMENT PERMIT

TR-0120 (REV 6/2000)

In compliance with (Check one):

- ☒ Your application of July 15, 2010
- ☐ Utility Notice No. _____ of _____
- ☐ Agreement No. _____ of _____
- ☐ R/W Contract No. _____ of _____

Permit No.

0110-N-MC-0298

Dist/Co/Rte/PM

01-DN, HUM, MEN-1, 101, 199, 255-VAR

Date

August 5, 2010

Fee Paid

\$ EXEMPT

Deposit

\$

Performance Bond Amount (1)

\$

Performance Bond Amount (2)

\$

Bond Company

Bond Number (1)

Bond Number (2)

PERMIT EXPIRES**November 1, 2010**

TO:

WHITE ENGINEERING
427 F STREET, SUITE 236
EUREKA, CA 95501

ATTN: DAVID KUSZMAR
(707) 444-3800

, PERMITTEE

and subject to the following, PERMISSION IS HERBY GRANTED to:

Enter the State highway right of way at various post miles on State Routes 1, 101, 199 and 255 in Del Norte, Humboldt and Mendocino Counties to temporary install and remove pedestrian traffic monitoring devices for collecting data on pedestrian and bicycle use and facilities at six locations as per the application received by the Caltrans District 1 Permit Office and as amended by this encroachment permit and all future riders.

A pre-job meeting with the assigned Department's Representative, Alyson Hunter, 707-441-4542, is required prior to the start of any work under this permit. Failure to do so may result in permit cancellation and resubmittal may be required. The Department's Representative shall be notified 5 days before work is initially started and 3 days prior to subsequent restarts.

THIS PERMIT IS NOT A PROPERTY RIGHT AND DOES NOT TRANSFER WITH THE PROPERTY TO A NEW OWNER.

The following attachments are also included as part of this permit (Check applicable):

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | General Provisions |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | Utility Maintenance Provisions |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | Special Provisions |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | Stormwater Special Provisions |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | A Cal-OSHA permit, if required: Permit No. _____ |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | As-Built Plans Submittal Route Slip for Locally Advertised Projects |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | Storm Water Pollution Protection Plan |

In addition to fee, the permittee will be billed actual costs for:

- | | | |
|---|--|------------|
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | Review |
| <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | Inspection |
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | Field Work |

(if any Caltrans effort expended)

- ☐ Yes ☒ No The information in the environmental documentation has been reviewed and considered prior to approval of this permit

This permit is void unless the work is completed before November 1, 2010

This permit is to be strictly construed and no other work other than specifically mentioned is hereby authorized.

No project work shall be commenced until all other necessary permits and environmental clearances have been obtained.

DT GEORGESON

TL LIBOLT

DE FIGUEIREDO

APPROVED:

DR RAMIREZ

CH HAFLEY

VJ CALLAHAN

K SCHULTZ+2

R JACKMAN

AM JONES+2

D YORK

K SARTORIUS

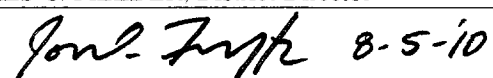
F ULULANI

C GRAHAM

HCAOG

CHARLES C. FIELDER, District Director

BY:



JON D. FORSYTH, P.E., District Permit Engineer

FILE

D.P.E.

Permit Writer: L FIELDS

SPECIAL PROVISIONS

In addition to the attached Encroachment Permit General Provisions, Form TR-0045, the following special provisions are applicable:

1. GENERAL INFORMATION

2. Chemical control or spraying, including herbicide treatment, is prohibited under this encroachment permit.
3. The Caltrans Encroachment Permit Field Inspectors shall be notified 5 working days in advance prior to planned work in the State right of way so as to inspect the signs and traffic control measures. For work in Humboldt and Del Norte Counties, call Vernon Callahan at 707-445-6679 and for sites in Mendocino County call Kelley Schultz at 707-463-4726.
4. This Encroachment Permit, as approved by the District Permit Engineer, shall take precedence in the event of any discrepancies between the Permittee's proposed plan and this Encroachment Permit (including amendments by future riders). The Department's Representative shall have the authority to resolve any discrepancies between the Permittee's proposed work and the approved Encroachment Permit (including amendments by future riders). If it is deemed by the Department's Representative that the proposed work is outside the scope of the permit the Permittee shall apply for a new encroachment permit.
5. The District Public Information Office, (707) 445-6444, shall be contacted two weeks in advance of the start of construction.
6. The Permittee shall contact the Senior Construction Engineer, Cindy Graham (707) 445-6642, to coordinate work with Caltrans construction contracts in Mendocino County.
7. The Permittee shall contact the Senior Construction Engineer, Friday Ululani (707) 498-4869, to coordinate work with Caltrans construction contracts in Humboldt and Del Norte Counties.
8. The State of California, Department of Transportation makes no assurance or expressed warranty that the plans are complete or that the planned construction fits field conditions. Should additional work or modifications of the work be required in order to meet established Department Standards or in order to fit field conditions, the work shall be performed by the Permittee as directed by the Department's Representative.
9. The Permittee's work shall be subordinated to any operations which the Department may conduct and shall not delay, nor interfere with the Department's Forces or the Department's Contractors.
10. All work on the State highway shall be done in conformance to current Caltrans construction and safety policies, guidelines and standards, including Encroachment Permit General Provisions
11. Permittee's attention is directed to General Provision #28, "Responsibility for Damage".
12. Only Contractors on a Permittee submitted Subcontractors list received by the Caltrans District 01 Permit Branch and approved by the Caltrans Permit Branch Chief shall be permitted to perform work under this Encroachment Permit.
13. Only the following list of subcontractor is permitted to perform work under this encroachment permit: Smith Electric Construction.

14. PEDESTRIAN DETOUR

15. A pedestrian detour shall be established for pedestrians when the work in progress restricts the sidewalks to a width of less than 4 feet.
16. Pedestrian detours shall be required when sidewalks are not available for public travel and shall be in conformance with "Figure 6H-28, "Sidewalk Detour or Diversion (TA-28)" or "Figure 6H-29, Crosswalk Closures and Pedestrian Detour (TA-29)" in the September 26, 2006 CA MUTCD for Street and Highways as appropriate.
17. The pedestrian detour shall be clearly defined, and maintained in a smooth, unobstructed condition that is free of tripping hazards.
18. At no time shall pedestrians be diverted onto a shoulder or traveled way of the State Highway.
19. If adjacent alternate walkways cannot be provided, appropriate signs and barricades shall be installed at the limits of the work area and in advance of the closure at the nearest cross walk or intersection to divert pedestrians across the street. All signs must be orange or white with black lettering at least 4" tall. The signs, barricades detour plan shall be approved by the Department's Representative.
20. The work area shall be closed to pedestrian traffic during construction and returned to a safe useable sidewalk at the end of each work shift.

21. TRAFFIC MONITORING DEVICES

SPECIAL PROVISIONS

22. Traffic Monitoring Devices, hereafter called devices, shall be installed as per the project description submitted with the encroachment permit application and as noted below.
23. All devices shall be installed on Caltrans street light poles, nearest to the monitoring locations specified above, using a single, 13.5-foot lean-to extension ladder. In locations where a light pole is not available, devices may be installed on nearby trees or other Caltrans signs/poles, provided such installation are approved in advance by the Department's Representative.
24. Devices shall be self-contained units inside a waterproof low-profile Pelican Box (roughly 12"H x 8"W x 6"). Devices shall be securely fastened in-place with flexible strapping, without modifying the pole, post or tree in any way.
25. Permittee shall determine specific safe locations for parking vehicles with the appropriate Department's Representative in advanced of beginning work.
26. Each day, prior to the Permitted operation, the Permittee shall make contact with the appropriate Department Representative.
27. All Permittee operations shall be conducted off the traveled way.
28. Devices shall be furnished and installed at the locations shown on the plans or where designated and approved in the field by the Department's Representative in advance of the work.
29. Devices shall be placed so as not to interfere with sight distance of any operational feature within the Caltrans Right of Way.
30. Existing facilities shall not be altered or impaired. Devices may be fastened in place with flexible strapping, without modifying existing facilities in any way. Devices shall be securely fastened.
31. Upon completions of data collection operations, all devices shall be removed in their entirety and the State highway right of way restored to pre-existing condition.
32. A copy of the collected data shall be sent to the Department's Representative.
33. ENVIRONMENTAL
34. The Permittee's attention is directed to Section 12, "Permits from Other Agencies," and Section 26 "Archaeological/Historical," of the Encroachment Permit General Provisions. The Caltrans Representative for the District 01 Environmental Branch is Dana York at (707) 445-6416.
35. TRAFFIC CONTROL
36. Traffic control, other than shoulder closure, is not authorized under this encroachment permit.
37. By noon Monday, for work in Del Norte and Humboldt County, the Permittee/Contractor shall fax to the Department's Representative at 707-445-6317 and to Jeannette Candalot, Caltrans Traffic Operations (fax # 707 441-3914) a written schedule of planned closures for the following week period, defined as Friday Midnight through the following Friday Midnight. The term closure, as used herein, is defined as the closure of a traffic lane or lanes, including ramp or connector lanes, within a single traffic control system. The Closure Schedule shall take the form of the attached District 1 Lane Closure Request Form furnished by the District Permit Engineer and shall show the locations and times when the proposed closures are to be in effect. Include times of closures under the "Details" paragraph at the bottom of the page. Closure Schedules submitted to the Department's Representative and Traffic Operations with incomplete, unintelligible or inaccurate information will be returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.
38. By noon Monday, for work in Mendocino County, the Permittee/Contractor shall fax to the Department's Representative at 707-463-4736 and to Jeannette Candalot, Caltrans Traffic Operations (fax # 707 441-3914) a written schedule of planned closures for the following week period, defined as Friday Midnight through the following Friday Midnight. The term closure, as used herein, is defined as the closure of a traffic lane or lanes, including ramp or connector lanes, within a single traffic control system. The Closure Schedule shall take the form of the attached District 1 Lane Closure Request Form furnished by the District Permit Engineer and shall show the locations and times when the proposed closures are to be in effect. Include times of closures under the "Details" paragraph at the bottom of the page. Closure Schedules submitted to the Department's Representative and Traffic Operations with incomplete, unintelligible or inaccurate information will be returned for correction and resubmittal. The Contractor will be notified of disapproved closures or closures that require coordination with other parties as a condition of approval.
39. For work in Mendocino County a Lane Closure Request form shall be submitted to the Ukiah Permit Office by phone, fax or email by Monday of the week prior to the week of the work being done.

SPECIAL PROVISIONS

40. All traffic control shall conform to the "CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES for Streets and Highways (FHWA's MUTCD 2003 Edition, as amended for use in California) issued September 26, 2006". (Copies of the California MUTCD are available online at:
<http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/pdf/camutcd/CaliforniaMUTCD.pdf>
41. Except for installing, maintaining and removing traffic control devices, no work is authorized in the following work areas:
- | Approach speed of public traffic (Posted Limit)
(Miles per Hour) | Work Area |
|---|--|
| Over 45 | within 6 feet of a traffic lane but not on a traffic lane. |
| 35 to 45 | within 3 feet of a traffic lane but not on a traffic lane. |
42. At a minimum a SHOULDER CLOSURE consisting of a "Shoulder Work Ahead" sign and a line of cones extending through the work area shall be in place when work is in progress.
43. The full width of the traveled way shall be open for use by public traffic at all times.
44. Work authorized under this encroachment permit shall not interfere with or hide traffic signals or traffic signs.
45. Work on this project shall be coordinated with the Humboldt County Association of Governments.
46. No work is authorized within the State Highway Right of Way under this encroachment permit when fog or inclement weather reduces visibility of signs, flaggers or work operations to less than 1,500 feet or when rain is falling.
47. Access to side roads and residences shall be maintained at all times. Business access shall be maintained during regular business hours.
48. Permittee shall conduct traffic control operations only during non-peak hours of traffic volume unless otherwise approved by the Department's Representative in advance of the work.
49. This work shall occur during daylight hours only. Daylight hours are determined by the sunset and sunrise times as posted in the local newspaper publications.
50. EXISTING HIGHWAY FACILITIES
51. The Permittee and/or contractor shall clean the surface of the highway if dirt, mud, or other debris that is tracked onto the roadway prior to leaving the State highway right of way.
52. Any ground that is disturbed by wheel rutting of the job must be graded to match the surrounding area and returned to original condition as much as possible.
53. All clean up work shall be approved to the line and grade approved by the Department's Representative and to the satisfaction of the Department's Representative.
54. Permittee's attention is directed to General Provision #18, "Restoration and Repairs in Right of Way".
55. OTHER REQUIREMENTS
56. Tree trimming or vegetation removal is not authorized under this encroachment permit.
57. Stockpiling of materials or equipment within the State highway right-of-way is strictly prohibited.
58. All personnel working within the State right-of-way shall be provided with and wear appropriate personal safety equipment. This includes but is not limited to hard hats, Class II or Class III safety vests and any other required equipment.
59. Upon completion of the work, please fill in the attached post card and mail at once.
60. If the work covered by this permit is not completed by the completion date shown, the Permittee shall be responsible for requesting a time extension rider for a maximum of two 90-day periods in writing at the following address:
Caltrans Permit Office
Attn: Jon Forsyth
District Permit Engineer
P.O. Box 3700
Eureka, CA 95502
TEL. #: (707) 445-6389 FAX. # (707) 445-6317 EMAIL: jon.forsyth@dot.ca.gov
61. An Encroachment permit application may be obtained at the following website address:
<http://www.dot.ca.gov/hq/traffops/developserv/permits/applications/index.html>

1. **AUTHORITY:** The Department's authority to issue encroachment permits is provided under, Div. 1, Chpt. 3, Art. 1, Sect. 660 to 734 of the Streets and Highways Code.
2. **REVOCATION:** Encroachment permits are revocable on five days notice unless otherwise stated on the permit and except as provided by law for public corporations, franchise holders, and utilities. These General Provisions and the Encroachment Permit Utility Provisions are subject to modification or abrogation at any time. Permittees' joint use agreements, franchise rights, reserved rights or any other agreements for operating purposes in State highway right of way are exceptions to this revocation.
3. **DENIAL FOR NONPAYMENT OF FEES:** Failure to pay permit fees when due can result in rejection of future applications and denial of permits.
4. **ASSIGNMENT:** No party other than the permittee or permittee's authorized agent is allowed to work under this permit.
5. **ACCEPTANCE OF PROVISIONS:** Permittee understands and agrees to accept these General Provisions and all attachments to this permit, for any work to be performed under this permit.
6. **BEGINNING OF WORK:** When traffic is not impacted (see Number 35), the permittee shall notify the Department's representative, two (2) days before the intent to start permitted work. Permittee shall notify the Department's Representative if the work is to be interrupted for a period of five (5) days or more, unless otherwise agreed upon. All work shall be performed on weekdays during regular work hours, excluding holidays, unless otherwise specified in this permit.
7. **STANDARDS OF CONSTRUCTION:** All work performed within highway right of way shall conform to recognized construction standards and current Department Standard Specifications, Department Standard Plans High and Low Risk Facility Specifications, and Utility Special Provisions. Where reference is made to "Contractor and Engineer," these are amended to be read as "Permittee and Department representative."
8. **PLAN CHANGES:** Changes to plans, specifications, and permit provisions are not allowed without prior approval from the State representative.
9. **INSPECTION AND APPROVAL:** All work is subject to monitoring and inspection. Upon completion of work, permittee shall request a final inspection for acceptance and approval by the Department. The local agency permittee shall not give final construction approval to its contractor until final acceptance and approval by the Department is obtained.
10. **PERMIT AT WORKSITE:** Permittee shall keep the permit package or a copy thereof, at the work site and show it upon request to any Department representative or law enforcement officer. If the permit package is not kept and made available at the work site, the work shall be suspended.
11. **CONFLICTING ENCROACHMENTS:** Permittee shall yield start of work to ongoing, prior authorized, work adjacent to or within the limits of the project site. When existing encroachments conflict with new work, the permittee shall bear all cost for rearrangements, (e.g., relocation, alteration, removal, etc.).
12. **PERMITS FROM OTHER AGENCIES:** This permit is invalidated if the permittee has not obtained all permits necessary and required by law, from the Public Utilities Commission of the State of California (PUC), California Occupational Safety and Health Administration (Cal-OSHA), or any other public agency having jurisdiction.
13. **PEDESTRIAN AND BICYCLIST SAFETY:** A safe minimum passageway of 4' shall be maintained through the work area at existing pedestrian or bicycle facilities. At no time shall pedestrians be diverted onto a portion of the street used for vehicular traffic. At locations where safe alternate passageways cannot be provided, appropriate signs and barricades shall be installed at the limits of construction and in advance of the limits of construction at the nearest crosswalk or intersection to detour pedestrians to facilities across the street. Attention is directed to Section 7-1.09 Public Safety of the Department Standard Specifications.
14. **PUBLIC TRAFFIC CONTROL:** As required by law, the permittee shall provide traffic control protection warning signs, lights, safety devices, etc., and take all other measures necessary for traveling public's safety. While providing traffic control, the needs and control of all road users [motorists, bicyclists and pedestrians, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA)] shall be an essential part of the work activity.

Day and night time lane closures shall comply with the California Manual on Uniform Traffic Control Devices (Part 6, Temporary Traffic Control), Standard Plans, and Standard Specifications for traffic control systems. These General Provisions are not intended to impose upon the permittee, by third parties, any duty or standard of care, greater than or different from, as required by law.
15. **MINIMUM INTERFERENCE WITH TRAFFIC:** Permittee shall plan and conduct work so as to create the least possible inconvenience to the traveling public; traffic shall not be unreasonably delayed. On conventional highways, permittee shall place properly attired flagger(s) to stop or warn the traveling public in compliance with the California Manual on Uniform Traffic Control Devices (Chapter 6E, Flagger Control).
16. **STORAGE OF EQUIPMENT AND MATERIALS:** The storage of equipment or materials is not allowed within State highway right-of-way, unless specified within the Special Provisions of this specific encroachment permit. If Encroachment Permit Special Provisions allow for the storage of equipment or materials within the State right of way, the equipment and material storage shall comply with Standard Specifications, Standard Plans, Special Provisions, and the Highway Design Manual. The clear recovery zone widths must be followed and are the minimum desirable for the type of facility indicated below: freeways and expressways - 30', conventional highways (no curbs) - 20', conventional highways (with curbs) - 1.5'. If a fixed object cannot be eliminated, moved outside the clear recovery zone, or modified to be made yielding, it should be shielded by a guardrail or a crash cushion.
17. **CARE OF DRAINAGE:** Permittee shall provide alternate drainage for any work interfering with an existing drainage facility in compliance with the Standard Specifications, Standard Plans and/or as directed by the Department's representative.
18. **RESTORATION AND REPAIRS IN RIGHT OF WAY:** Permittee is responsible for restoration and repair of State highway right of way resulting from permitted work (State Streets and Highways Code, Sections 670 et. seq.).

19. **RIGHT OF WAY CLEAN UP:** Upon completion of work, permittee shall remove and dispose of all scraps, brush, timber, materials, etc. off the right of way. The aesthetics of the highway shall be as it was before work started.
 20. **COST OF WORK:** Unless stated in the permit, or a separate written agreement, the permittee shall bear all costs incurred for work within the State right of way and waives all claims for indemnification or contribution from the State.
 21. **ACTUAL COST BILLING:** When specified in the permit, the Department will bill the permittee actual costs at the currently set hourly rate for encroachment permits.
 22. **AS-BUILT PLANS:** When required, permittee shall submit one (1) set of folded as-built plans within thirty (30) days after completion and approval of work in compliance with requirements listed as follows:
 1. Upon completion of the work provided herein, the permittee shall send one vellum or paper set of As-Built plans, to the State representative. Mylar or paper sepia plans are not acceptable.
 2. All changes in the work will be shown on the plans, as issued with the permit, including changes approved by Encroachment Permit Rider.
 3. The plans are to be stamped or otherwise noted AS-BUILT by the permittee's representative who was responsible for overseeing the work. Any original plan that was approved with a State stamp, or Caltrans representative signature, shall be used for producing the As-Built plans.
 4. If As-Built plans include signing or striping, the dates of signing or striping removal, relocation, or installation shall be shown on the plans when required as a condition of the permit. When the construction plans show signing and striping for staged construction on separate sheets, the sheet for each stage shall show the removal, relocation or installation dates of the appropriate staged striping and signing.
 5. As-Built plans shall contain the Permit Number, County, Route, and Post Mile on each sheet.
 6. Disclaimer statement of any kind that differ from the obligations and protections provided by Sections 6735 through 6735.6 of the California Business and Professions Code, shall not be included on the As-Built plans. Such statements constitute non-compliance with Encroachment Permit requirements, and may result in the Department of Transportation retaining Performance Bonds or deposits until proper plans are submitted. Failure to comply may also result in denial of future permits, or a provision requiring a public agency to supply additional bonding.
 23. **PERMITS FOR RECORD PURPOSES ONLY:** When work in the right of way is within an area under a Joint Use Agreement (JUA) or a Consent to Common Use Agreement (CCUA), a fee exempt permit is issued to the permittee for the purpose of providing a notice and record of work. The Permittee's prior rights shall be preserved without the intention of creating new or different rights or obligations. "Notice and Record Purposes Only" shall be stamped across the face of the permit.
 24. **BONDING:** The permittee shall file bond(s), in advance, in the amount set by the Department. Failure to maintain bond(s) in full force and effect will result in the Department stopping of all work and revoking permit(s). Bonds are not required of public corporations or privately owned utilities, unless permittee failed to comply with the provision and conditions under a prior permit. The surety company is responsible for any latent defects as provided in California Code of Civil Procedures, Section 337.15. Local agency permittee shall comply with requirements established as follows: In recognition that project construction work done on State property will not be directly funded and paid by State, for the purpose of protecting stop notice claimants and the interests of State relative to successful project completion, the local agency permittee agrees to require the construction contractor furnish both a payment and performance bond in the local agency's name with both bonds complying with the requirements set forth in Section 3-1.02 of State's current Standard Specifications before performing any project construction work. The local agency permittee shall defend, indemnify, and hold harmless the State, its officers and employees from all project construction related claims by contractors and all stop notice or mechanic's lien claimants. The local agency also agrees to remedy, in a timely manner and to State's satisfaction, any latent defects occurring as a result of the project construction work.
 25. **FUTURE MOVING OF INSTALLATIONS:** Permittee understands and agrees to relocate a permitted installation upon notice by the Department. Unless under prior property right or agreement, the permittee shall comply with said notice at his sole expense.
 26. **ARCHAEOLOGICAL/HISTORICAL:** If any archaeological or historical resources are revealed in the work vicinity, the permittee shall immediately stop work, notify the Department's representative, retain a qualified archaeologist who shall evaluate the site, and make recommendations to the Department representative regarding the continuance of work.
 27. **PREVAILING WAGES:** Work performed by or under a permit may require permittee's contractors and subcontractors to pay appropriate prevailing wages as set by the Department of Industrial Relations. Inquiries or requests for interpretations relative to enforcement of prevailing wage requirements are directed to State of California Department of Industrial Relations, 525 Golden Gate Avenue, San Francisco, California 94102.
 28. **RESPONSIBILITY FOR DAMAGE:** The State of California and all officers and employees thereof, including but not limited to the Director of Transportation and the Deputy Director, shall not be answerable or accountable in any manner for injury to or death of any person, including but not limited to the permittee, persons employed by the permittee, persons acting in behalf of the permittee, or for damage to property from any cause. The permittee shall be responsible for any liability imposed by law and for injuries to or death of any person, including but not limited to the permittee, persons employed by the permittee, persons acting in behalf of the permittee, or for damage to property arising out of work, or other activity permitted and done by the permittee under a permit, or arising out of the failure on the permittee's part to perform his obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity or at any subsequent time, work or other activity is being performed under the obligations provided by and contemplated by the permit.
- The permittee shall indemnify and save harmless the State of California, all officers, employees, and State's contractors, thereof, including but not limited to the Director of Transportation and the Deputy Director, from all claims, suits or actions of every name, kind and description brought for or on account of injuries to or death of any person, including but not limited to the permittee, persons employed by the permittee, persons acting in behalf of the permittee and the public, or damage to property resulting from the performance of work or other activity under the permit, or arising out of the failure on the permittee's part to perform his obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity or at any subsequent time, work or other activity is being performed under the obligations provided by and contemplated by the permit, except as otherwise provided by statute.

The duty of the permittee to indemnify and save harmless includes the duties to defend as set forth in Section 2778 of the Civil Code. The permittee waives any and all rights to any type of expressed or implied indemnity against the State, its officers, employees, and State contractors. It is the intent of the parties that the permittee will indemnify and hold harmless the State, its officers, employees, and State's contractors, from any and all claims, suits or actions as set forth above regardless of the existence or degree of fault or negligence, whether active or passive, primary or secondary, on the part of the State, the permittee, persons employed by the permittee, or acting on behalf of the permittee.

For the purpose of this section, "State's contractors" shall include contractors and their subcontractors under contract to the State of California performing work within the limits of this permit.

29. **NO PRECEDENT ESTABLISHED:** This permit is issued with the understanding that it does not establish a precedent.

30. **FEDERAL CIVIL RIGHTS REQUIREMENTS FOR PUBLIC ACCOMMODATION:**

A. The permittee, for himself, his personal representative, successors in interest, and assigns as part of the consideration hereof, does hereby covenant and agree that:

1. No person on the grounds of race, color, or national origin shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.

2. That in connection with the construction of any improvements on said lands and the furnishings of services thereon, no discrimination shall be practiced in the selection and retention of first-tier subcontractors in the selection of second-tier subcontractors.

3. That such discrimination shall not be practiced against the public in their access to and use of the facilities and services provided for public accommodations (such as eating, sleeping, rest, recreation), and operation on, over, or under the space of the right of way.

4. That the permittee shall use the premises in compliance with all other requirements imposed pursuant to Title 15, Code of Federal Regulations, Commerce and Foreign Trade, Subtitle A. Office of the Secretary of Commerce, Part 8 (15 C.F.R. Part 8) and as said Regulations may be amended.

5. That in the event of breach of any of the above nondiscrimination covenants, the State shall have the right to terminate the permit and to re-enter and repossess said land and the land and the facilities thereon, and hold the same as if said permit had never been made or issued.

31. **MAINTENANCE OF HIGHWAYS:** The permittee agrees, by acceptance of a permit, to properly maintain any encroachment. This assurance requires the permittee to provide inspection and repair any damage, at permittee's expense, to State facilities resulting from the encroachment.

32. **SPECIAL EVENTS:** In accordance with subdivision (a) of Streets and Highways Code Section 682.5, the Department of Transportation shall not be responsible for the conduct or operation of the permitted activity, and the applicant agrees to defend, indemnify, and hold harmless the State and the city or county against any and all claims arising out of any activity for which the permit is issued.

The permittee understands and agrees to comply with the obligations of Titles II and III of the Americans with Disabilities Act of 1990 in the conduct of the event, and further agrees to indemnify and save harmless the State of California, all officers and employees thereof, including but not limited to the Director of Transportation, from any claims or liability arising out of or by virtue of said Act.

33. **PRIVATE USE OF RIGHT OF WAY:** Highway right of way shall not be used for private purposes without compensation to the State.

The gifting of public property use and therefore public funds is prohibited under the California Constitution, Article 16.

34. **FIELD WORK REIMBURSEMENT:** Permittee shall reimburse State for field work performed on permittee's behalf to correct or remedy hazards or damaged facilities, or clear debris not attended to by the permittee.

35. **NOTIFICATION OF DEPARTMENT AND TMC:** The permittee shall notify the Department's representative and the Transportation Management Center (TMC) at least 7 days before initiating a lane closure or conducting an activity that may cause a traffic impact. A confirmation notification should occur 3 days before closure or other potential traffic impacts. In emergency situations when the corrective work or the emergency itself may affect traffic, TMC and the Department's representative shall be notified as soon as possible.

36. **SUSPENSION OF TRAFFIC CONTROL OPERATION:** The permittee, upon notification by the Department's representative, shall immediately suspend all lane closure operations and any operation that impedes the flow of traffic. All costs associated with this suspension shall be borne by the permittee.

37. **UNDERGROUND SERVICE ALERT (USA) NOTIFICATION:** Any excavation requires compliance with the provisions of Government Code Section 4216 et. seq., including, but not limited to notice to a regional notification center, such as Underground Service Alert (USA). The permittee shall provide notification at least 48 hours before performing any excavation work within the right of way.

Notes for Figure 6H-28—Typical Application 28

Sidewalk Closures and Bypass Sidewalks

Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Guidance:

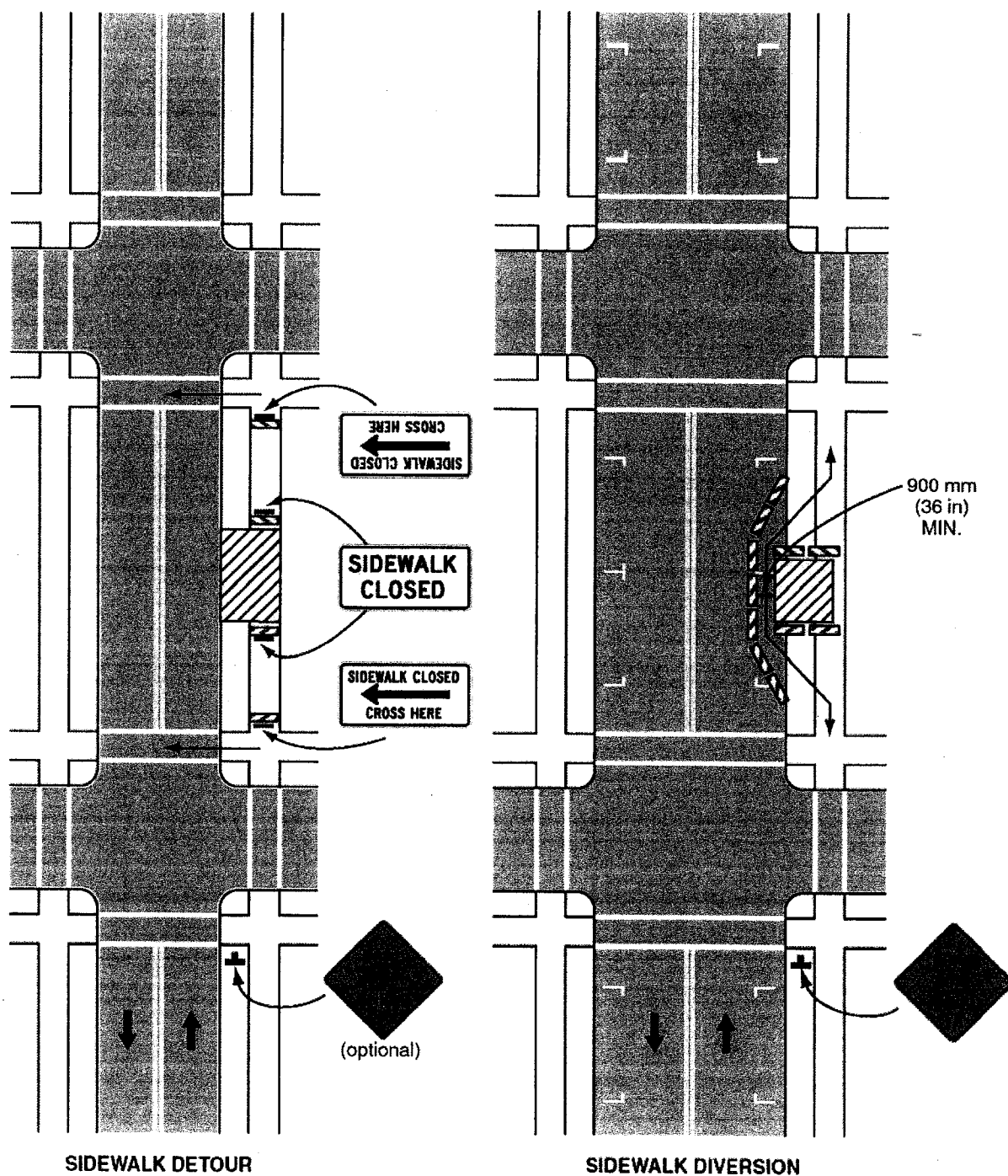
2. Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.
3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

Option:

4. Street lighting may be considered.
 5. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
 6. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.
 7. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the temporary sidewalks from vehicular traffic flow.
 8. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.
-

(This space left intentionally blank)

Figure 6H-28. Sidewalk Detour or Diversion (TA-28)



Typical Application 28

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Notes for Figure 6H-29—Typical Application 29

Crosswalk Closures and Pedestrian Detours

Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. ~~Curb parking shall be prohibited for at least 15 m (50 ft) in advance of the midblock crosswalk.~~

Guidance:

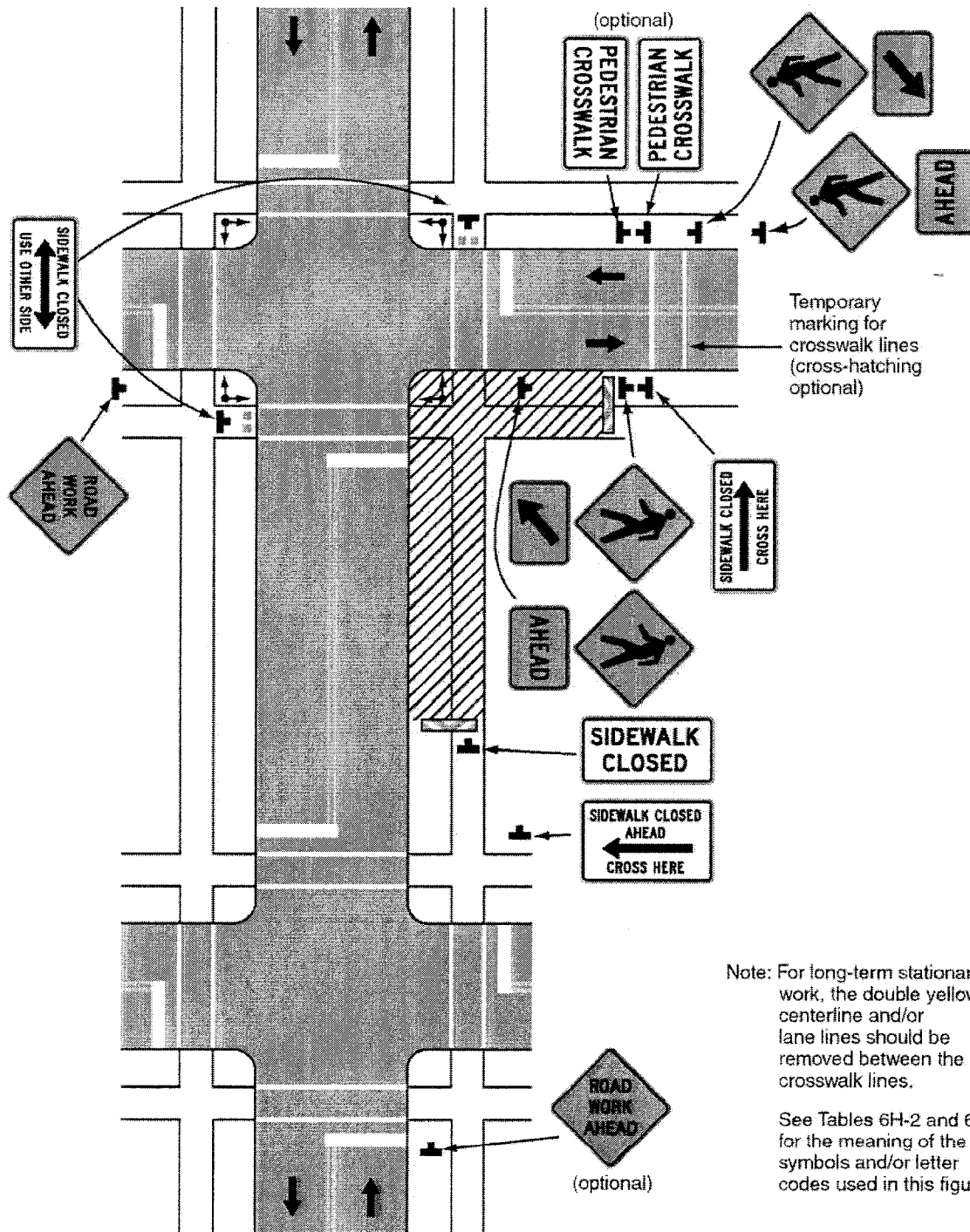
2. Parking should be prohibited in advance of mid-block crosswalks. Mid-block crosswalks should be avoided, when possible. See Section 3B.17.
3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.
4. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.

Option:

5. Street lighting may be considered.
 6. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
 7. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.
 8. Type C Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.
 9. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.
-

(This space left intentionally blank)

Figure 6H-29. Crosswalk Closures and Pedestrian Detours (TA-29)



Typical Application 29



DISTRICT 01 ENCROACHMENT PERMITS BRANCH
LANE CLOSURE REQUEST FORM

THIS FORM MUST BE SUBMITTED BY NOON ON MONDAY PRIOR TO THE WEEK OF THE PLANNED
RESTRICTION.

COMPLETE FORM AND SUBMIT BY FAX TO THE TWO APPROPRIATE FAX NUMBERS INDICATED AT THE
BOTTOM OF THE PAGE.

Today's Date: _____ Time: _____

Permittee: _____

Permittee: _____

Field Contact _____

Phone #: _____

Cell _____

Encroachment Permit #: _____

Office _____

Pager _____

FAX _____

LOCATION & DATE OF CLOSURE:

FOR THE WEEK OF: _____

Reporting Week begins on Saturday

Days(s): ☐ Saturday ☐ Sunday ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday

	COUNTY	ROUTE	PM	KP	DESCRIPTIVE LOCATION	TIME
FROM						
TO						

Types of Closure, Closure Characteristics (check all of the following that apply):

- ☐ One-Way ☐ Complete Closure ☐ 24 - Hour / 7 Day - closure ☐ Detour info available
☐ No detour available ☐ Ramp Closures ☐ COZEEP/MAZEEP
☐ Northbound ☐ Southbound ☐ Eastbound ☐ Westbound

- ☐ Closure conforms to the FHWA's Manual of Uniform Traffic Control Devices (*MUTCD*) 2003 EDITION & *MUTCD CALIFORNIA SUPPLEMENT*, copies of which are available online at <http://mutcd.fhwa.dot.gov> and <http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp>, respectively

Estimated Delay: _____ Minutes Reason for Restriction: _____

Details: (Detour information, CHP Break, Flaggers, Temporary Signals, Estimated reopen date CMS Equipment, etc.)

- FAX FORM TO JEANNETTE CANDALOT @ 707-441-3914 AND:
- JIM SHUPE @ 707-463-4736 FOR MENDOCINO & LAKE COUNTIES OR
- CHRIS P. CLIFFORD/VERNON J. CALLAHAN @ 707-445-6317 FOR HUMBOLDT & DEL NORTE COUNTIES

218

STANDARD ENCROACHMENT PERMIT APPLICATION

TR-0100 (REV. 07/2007)

Permission is requested to encroach on the State Highway right-of-way as follows:

(Complete all BOXES [write N/A if not applicable])

This application is not complete until all requirements have been approved.

1. COUNTY Humboldt / Mendocino / Del Norte		2. ROUTE (varies)		3. POSTMILE (See Item 17.)	
4. ADDRESS OR STREET NAME (See Item 17.)			5. CITY (See Item 17.)		
6. CROSS STREET (Distance and direction from site) (See Item 17.)			7. PORTION OF RIGHT-OF-WAY (varies)		
8. WORK TO BE PERFORMED BY <input checked="" type="checkbox"/> OWN FORCES <input checked="" type="checkbox"/> CONTRACTOR			9. EST. START DATE August 1, 2010		10. EST. COMPLETION DATE October 31, 2010
11. EXCAVATION	MAX. DEPTH N/A	AVG. DEPTH N/A	AVG. WIDTH N/A	LENGTH N/A	SURFACE TYPE N/A
12. EST. COST IN STATE HIGHWAY RIGHT-OF-WAY \$0.00				FUNDING SOURCE(S) <input type="checkbox"/> FEDERAL <input checked="" type="checkbox"/> STATE <input type="checkbox"/> LOCAL <input type="checkbox"/> PRIVATE	
13. PIPES	PRODUCT TYPE N/A	DIAMETER N/A	VOLTAGE / PSIG N/A		14. CALTRANS PROJECT E.A. NUMBER N/A
15. <input type="checkbox"/> Double Permit Parent Permit Number <u>N/A</u> Applicant's Reference Number / Utility Work Order Number <u>N/A</u>					

FOR CALTRANS USE	
PERMIT NO.	<u>0110-N-MC-0298</u>
DIST/CO/RTE/PM	<u>01-VAR-VAR-VAR</u>
SIMPLEX STAMP	
000298	
01 67N MC	
DATE OF SIMPLEX STAMP 7-15-10	

16. Have your plans been reviewed by another Caltrans branch? ☐ NO ☒ YES (If "YES") Who? District 1 System Planning

17. Completely describe work to be done within STATE highway right-of-way :

Attach 6 complete sets of **FOLDED** plans (folded 8.5" x 11"), and any applicable specifications, calculations, maps, etc.
All dimensions shall be in U.S. Customary (English) Units.

(See attached Project Description.)

RECEIVED
JUL 13 2010
PERMITS

18. Is a city, county, or other agency involved in the approval of this project?

☐ YES (If "YES", check type of project and attach environmental documentation and conditions of approval.)☐ COMMERCIAL DEVELOPMENT ☐ BUILDING ☐ GRADING ☐ OTHER _____☐ CATEGORICALLY EXEMPT ☐ NEGATIVE DECLARATION ☐ ENVIRONMENTAL IMPACT REPORT ☐ OTHER _____☒ NO (If "NO", please check the category below which best describes the project, and complete page 4 of this application.)☐ DRIVEWAY OR ROAD APPROACH, RECONSTRUCTION, MAINTENANCE, OR RESURFACING☐ FENCE☐ PUBLIC UTILITY MODIFICATIONS, EXTENSIONS, HOOKUPS☐ MAILBOX☐ FLAGS, SIGNS, BANNERS, DECORATIONS, PARADES AND CELEBRATIONS☐ EROSION CONTROL☒ OTHER Temporary pedestrian traffic monitoring devices☐ LANDSCAPING

19. Will this project cause a substantial change in the significance of a historical resource (45 years or older), or cultural resource?

☐ YES ☒ NO

(If "YES", provide a description)

20. Is this project on an existing highway or street where the activity involves removal of a scenic resource including a significant tree or stand of trees, a rock outcropping or a historic building? ☐ YES ☒ NO (If "YES", provide a description)21. Is work being done on applicant's property? ☐ YES ☒ NO (If "YES", attach site and grading plans.)**ADA NOTICE:** For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write to Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814

STANDARD ENCROACHMENT PERMIT APPLICATION

TR-0100 (REV. 07/2007)

PERMIT NO.

0110-N-MC-0298

22. Will this proposed project require the disturbance of soil?

☐ YES ☒ NOIf "YES", estimate the area within State Highway right-of-way in square feet AND acres: _____ (ft²) AND _____ (acres)estimate the area outside of State Highway right-of-way in square feet AND acres: _____ (ft²) AND _____ (acres)

23. Will this proposed project require dewatering?

☐ YES ☒ NO

If "YES", estimate total gallons AND gallons/month. _____ (gallons) AND _____ (gallons/month)

SOURCE*: ☐ STORMWATER ☐ NON-STORMWATER(*See Caltrans SWMP for definitions of non-storm water discharge: <http://www.dot.ca.gov/hq/env/stormwater/index.htm>)

24. How will any storm water or ground water be disposed of from within or near the limits of this proposed project?

☐ Storm Drain System ☐ Combined Sewer / Storm System ☐ Storm Water Retention Basin☒ Other(explain): N/ARECEIVED
JUL 12 2010
PERMITSPLEASE READ THE FOLLOWING CLAUSES PRIOR TO SIGNING THIS ENCROACHMENT PERMIT APPLICATION.

The applicant, understands and herein agrees to that an encroachment permit can be denied, and/or a bond required for non-payment of prior or present encroachment permit fees. Encroachment Permit fees may still be due when an application is withdrawn or denied, and that a denial may be appealed, in accordance with the California Streets and Highways Code, Section 671.5. All work shall be done in accordance with Caltrans rules and regulations subject to inspection and approval.

The applicant, understands and herein agrees to the general provisions, special provisions and conditions of the encroachment permit, and to indemnify and hold harmless the State, its officers, directors, agents, employees and each of them (Indemnitees) from and against any and all claims, demands, causes of action, damages, costs, expenses, actual attorneys' fees, judgments, losses and liabilities of every kind and nature whatsoever (Claims) arising out of or in connection with the issuance and/or use of this encroachment permit and the placement and subsequent operation and maintenance of said encroachment for: 1) bodily injury and/or death to persons including but not limited to the Applicant, the State and its officers, directors, agents and employees, the Indemnities, and the public; and 2) damage to property of anyone. Except as provided by law, the indemnification provisions stated above shall apply regardless of the existence or degree of fault of Indemnities. The Applicant, however, shall not be obligated to indemnify Indemnities for Claims arising from the sole negligence and willful misconduct of State, its officers, directors, agents or employees.

DISCHARGES OF STORM WATER AND NON-STORM WATER: Work within State Highway right-of-way shall be conducted in compliance with all applicable requirements of the National Pollutant Discharge Elimination System (NPDES) permit issued to the Department of Transportation (Department), to govern the discharge of storm water and non-storm water from its properties. Work shall also be in compliance with all other applicable Federal, State and Local laws and regulations, and with the Department's Encroachment Permits Manual and encroachment permit. Compliance with the Departments NPDES permit requires amongst other things, the preparation and submission of a Storm Water Pollution Protection Plan (SWPPP), or a Water Pollution Control Program (WPCP), and the approval of same by the appropriate reviewing authority prior to the start of any work. Information on the requirements may also be reviewed on the Department's Construction Website at:

<http://www.dot.ca.gov/hq/construc/stormwater/stormwater1.htm>

25. NAME of APPLICANT or ORGANIZATION (Print or Type)

White Engineering

E-MAIL ADDRESS

david@whiteengineering.net

ADDRESS of APPLICANT or ORGANIZATION WHERE PERMIT IS TO BE MAILED (Include City and Zip Code)

427 F Street, Suite 236, Eureka, CA 95501

PHONE NUMBER

(707) 444-3800

FAX NUMBER

(707) 444-3900

26. NAME of AUTHORIZED AGENT / ENGINEER (Print or Type)

IS LETTER OF AUTHORIZATION ATTACHED?

☐ YES☐ NO

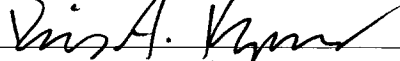
E-MAIL ADDRESS

ADDRESS of AUTHORIZED AGENT / ENGINEER (Include City and Zip Code)

PHONE NUMBER

FAX NUMBER

27. SIGNATURE of APPLICANT or AUTHORIZED AGENT



28. PRINT OR TYPE NAME

David Kuszmar, P.E.

29. TITLE

Project Manager

30. DATE

7/9/10

STANDARD ENCROACHMENT PERMIT APPLICATION

TR-0100 (REV. 07/2007)

PERMIT NO.

0110-N-MC-0298

WORK ORDER/REFERENCE NUMBER

FEE CALCULATION -- FOR CALTRANS USE

☐ CASH ☐ CREDITCARD NAME ON CARD _____ PHONE NUMBER _____
☐ CHECK NUMBER _____ NAME ON CHECK _____ PHONE NUMBER _____
☒ EXEMPT ☐ PROJECT EA _____ ☐ DEFERRED BILLING (Utility)

CALCULATED BY	(1)		(2)		
REVIEW	1. FEE / DEPOSIT	DATE	2. FEE / DEPOSIT	DATE	TOTAL FEE / DEPOSIT
1. _____ HOURS @ \$ _____ *	\$ _____				\$ _____
2. _____ HOURS @ \$ _____ *			\$ _____		\$ _____
INSPECTION	1. FEE / DEPOSIT	DATE	2. FEE / DEPOSIT	DATE	TOTAL FEE / DEPOSIT
1. _____ HOURS @ \$ _____ *	\$ _____				\$ _____
2. _____ HOURS @ \$ _____ *			\$ _____		\$ _____
FIELDWORK					
_____ HOURS @ \$ _____ *	\$ _____		\$ _____		\$ _____
EQUIPMENT & MATERIALS	DEPOSIT	DATE	DEPOSIT	DATE	DEPOSIT
	\$ _____		\$ _____		\$ _____
CASH DEPOSIT IN LIEU OF BOND	\$ _____		\$ _____		\$ _____
TOTAL COLLECTED	\$ <u>0</u>		\$ _____		
CASHIER'S INITIALS	_____		_____		\$ _____
* The current hourly rate is set annually by Headquarters Accounting. District Office staff do not have authority to modify this rate.					
PERFORMANCE BOND	<input type="checkbox"/>	DATE			AMOUNT \$
PAYMENT BOND	<input type="checkbox"/>	DATE			AMOUNT \$
LIABILITY INSURANCE REQUIRED?	<input type="checkbox"/> YES <input type="checkbox"/> NO				AMOUNT \$

RECEIVED
 JUL 13 2010
 PERMITS

STANDARD ENCROACHMENT PERMIT APPLICATION

TR-0100 (REV. 07/2007)

PERMIT NO.

0110-N-MC-0298

INSTRUCTIONS
for completing page 4

This page needs to be completed when the proposed project DOES NOT involve a City, County or other public agency.

Your answers to these questions will assist departmental staff in identifying any physical, biological, social or economic resources that may be affected by your proposed project within the State highway right-of-way. And, to determine which type of environmental studies may be required to approve your application for an encroachment permit.

It is the applicant's responsibility for the production of all required environmental documentation and supporting studies, in some cases this may be costly and time-consuming. If possible, attach photographs of the location of the proposed project.

Please answer these questions to the best of your ability. Provide a description of any "YES" answers (type, name, number, etc.)

1. Will any existing vegetation and/or landscaping within the highway right-of-way be disturbed?

No.

2. Are there waterways (e.g. river, creek, pond, natural pool or dry streambed) adjacent to or within the limits of the project or highway right-of-way?

No.

3. Is the proposed project located within five miles of the coast line?

Yes - Five of six project monitoring sites are located within 5 miles of the coast line.

4. Will the proposed project generate construction noise levels greater than 86 dBA (e.g. jack-hammering, pile driving)?

No.

5. Will the proposed project incorporate land from a public park, recreation area or wildlife refuge open to the public?

No.

6. Are there any recreational trails or paths within the limits of the proposed project or highway right-of-way?

No.

7. Will the proposed project impact any structures, buildings, rail lines, or bridges within highway right-of-way?

No.

8. Will the proposed project impact access to any businesses or residences?

No.

9. Will the proposed project impact any existing public utilities or public services?

No.

10. Will the proposed project impact existing pedestrian facilities, such as sidewalks, crosswalks, or overcrossings?

Possibly - At two of six project monitoring locations, a ladder may be placed on a sidewalk during monitoring device installation. (~60 minutes).

11. Will new lighting be constructed within or adjacent to highway right-of-way?

No.

RECEIVED
JUL 13 2010
PERMITS

Project Description (Item 17)

The work described below is part of the Non-Motorized Digital Data Collection on State Highways Pilot Project, managed by Caltrans District 1 System Planning, and administered by the Humboldt County Association of Governments.

Pedestrian traffic monitoring devices will be temporarily installed, then removed at six separate monitoring locations. The locations are as follows:

Humboldt County

- Intersection of West Wabash Ave and Broadway Street (Highway 101); Eureka CA
- Intersection of Indianola Cutoff and Highway 101; Eureka, CA
- Intersection of Lupin Drive and New Navy Base Road (Highway 255); Manila, CA

Mendocino County

- Intersection of East Laurel Street and North Main Street (Highway 1); Fort Bragg, CA
- Immediate vicinity of 10-mile Bridge on Highway 1; Fort Bragg, CA

Del Norte County

- Immediate vicinity of Downtown Hiouchi on Highway 199; Hiouchi CA

Devices will be installed/removed from shoulder or off-shoulder locations, depending on site configuration. All devices will be installed on Caltrans light poles, nearest to the monitoring locations specified above, using a single, 13.5-foot lean-to extension ladder. In locations where a light pole is not available, devices may be installed on nearby trees or other Caltrans signs/poles, provided such installations are approved in advance by Caltrans District 1 System Planning and Maintenance staff.

Devices will be self-contained units, weighing approximately ten pounds, consisting of a water-proof, low-profile Pelican box (roughly 12"H x 8"W x 6"D), containing a battery, digital video recorder, and some wires, with small "bullet" style camera attached to the bottom side. Devices will be securely fastened in place with flexible strapping, without modifying the pole in any way.

Devices will be installed by a two-person crew consisting of White Engineering (project lead) or Smith Electric Construction (project sub-contractor) staff, according to terms set forth in the project Proposal (March 4, 2010) and Consultant Services Contract (May 3, 2010). Both of these documents are available upon request.

One-to-three devices will be installed at each monitoring location, and will remain in place for a minimum duration of three days, and a maximum duration of seven days. Monitoring installations will occur in series, over the course of several weeks between August 1, 2010 and October 31, 2010.

RECEIVED
JUL 18 2010
PERMITS